NEHRU ARTS AND SCIENCE COLLEGE
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Nehru Gardens, Thirumalayampalayam, Coimbatore - 641 105, Tamil Nadu.

REGULATIONS, CURRICULUM & SYLLABUS

UMB

B. Sc. MICROBIOLOGY

Effective from 2023 – 2024

SYLLABUS

SEMESTER – I

Course Code	Title		
23U1TAM101	Part - I : Elanthamizh		
Semester : I	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	மொழி இலக்கியத்தின் வாயிலாக அறம் சார் பண்பு மற்றும் ஆளுமைமிக்க மாணவர்களை உருவாக்குதல்.		
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)		
Development Needs	Regional (உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)		
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல் மற்றும் உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	சங்க இலக்கியங்கள் வாயிலாக சமூகச் சீர்திருத்தச் சிந்தனைகள் பெறப்படும்.	விரிவுரை/ காணொளிப்பட விளக்கம்	ஒப்படைவு
CO 2	அற இலக்கியங்களின் வழி தமிழர்களின் வாழ்வியல் பண்புகளைக் கற்று அறிதல்.	விரிவுரை	குழுத்திட்டம்
CO 3	பெண்ணியக் கவிஞர்களின் படைப்புத்திறனை மாணவர்களுக்கு உணர்த்துதல்	விரிவுரை/ காணொளிப்பட விளக்கம்	கருத்தரங்கு
CO 4	சிறுகதைகளின் வழி சமூக கருத்துகளை மாணவர்களுக்கு அறிவுறுத்தல்	விரிவுரை / குழு விவாதம்	ஒப்படைவு
CO 5	தமிழ் இலக்கிய வரலாற்றுத்திறனை வளர்த்தல்	விரிவுரை/ குழு விவாதம்	கருத்தரங்கு

Offered by தமிழ்த்துறை

Course Content : Elanthamizh — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	சங்க இலக்கியம்	1. ஐங்குறுநூறு 2. பதிற்றுப்பத்து 3. பத்துப்பாட்டு - முல்லைப்பாட்டு 4. சிறுபாணாற்றுப்படை	கிள்ளைப்பத்து (281-290) பாடல்கள் இரண்டாம் பத்து (11 -15 ஐந்து பாடல்கள்) முல்லைப்பாட்டு முழுவதும் (1-103 வரிகள்) சேரநாட்டின் வளமை
		Instructional Hours	**12**
Suggested Learning Methods: நாடக முறையில் கலந்துரையாடல்			
II	அற இலக்கியம் நீதிநூல்கள்	1. அறன் வலியுறுத்தல் 2. புகழ் 3. வாய்மை 4. நாலடியார்-பொருட்பால் 5. நான்மணிக்கடிகை	31- 40 குறட்பாக்கள் 231 - 240 குறட்பாக்கள் 291 - 300 குறட்பாக்கள் 11 ஆவது அதிகாரம் (கூடா நட்பு 1-10) முதல் ஐந்து பாடல்கள்
		Instructional Hours	**12**
Suggested Learning Methods : கலந்துரையாடல்			
III	பெண்ணியக் கவிதைகள்	1. ஆண்டாள் பிரியதர்ஷினி 2. கவிஞர் இளம்பிறை 3. சுகிர்தராணி 4. அ. வெண்ணிலா	பூச்சிவாழ்க்கை - சுயம் பேசும் கிளி தொட்டிச்செடி அம்மா நீரில் அலையும் முகம்
		Instructional Hours	**12**
Suggested Learning Methods : புதுக்கவிதை எழுதும் திறன் பெற்றமை			

IV	சிறுகதைகள்	1. குட்டி ரேவதி 2. ஜெயமோகன் 3. ச.தமிழ்ச்செல்வன் 4. வண்ணநிலவன் 5. உமாமகேஸ்வரி	நிறைய அறைகள் உள்ள வீடு யானை டாக்டர் வெயிலோடு போய் எஸ்தர் மரப்பாச்சி
		Instructional Hours	**12**
Suggested Learning Methods : சிறுகதை படைக்கும் திறன் பெற்றமை			
V	தமிழ் இலக்கிய வரலாறு	1. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் 2. சிறுகதையின் தோற்றமும் வளர்ச்சியும் 3. படிமம், குறியீடு பற்றிய – விளக்கம்	தமிழ் இலக்கிய வரலாறு
		Instructional Hours	**12**
Suggested Learning Methods : குழு விவாதம்			
		Total Hours	**60**

Text Books	இளங்கலை முதலாம் ஆண்டு தமிழ் மாணவர்களுக்குரிய பாடநூல்"**இளந்தமிழ்"** தொகுப்பு: தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.
Reference Books	சங்க இலக்கியம்- உரையாசிரியர் ஔவை துரைசாமிப்பிள்ளை, பதிப்பாசிரியர்கள் இரா.இளங்குமரனார், முனைவர்.பி. தமிழ்மகன் தமிழ் மண் அறக்கட்டளை, சென்னை.17 நிறைய அறைகள் உள்ளவீடு - குட்டிரேவதி எழுத்து பிரசுரம், 11 மாடல் நகர், 10வது வீதி, சென்னை.
Web. URLs	https://youtu.be/2SMM5LvZYo0

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
4	4	5	2	2	3	20

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	-	H	H	M	H	-	-	-	-	-
CO2	-	-	M	-	H	L	H	H	-	-	-	-	-
CO3	-	-	L	-	M	M	H	H	-	-	-	-	-
CO4	-	-	H	-	H	M	M	L	-	-	-	-	-
CO5	-	-	H	-	H	L	H	H	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Satheesh Kumar	Dr. A. Sridevi

Course Code			
23U1HIN101	Part : I – Rachnathmak Hindi (रचनात्मकता हिन्दी)		
Semester : I	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	हिंदी भाषा का अच्छा ज्ञान प्राप्त करने के लिए।		
Course Category	Skill Development		
Development Needs	Regional		
Course Description	Improved accuracy & quality, improved communication		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	नाटक से रचनात्मकता का विकास होता है। यह हमारे आसपास की दुनिया को समझने में भी मदद करता है।	Lecture / Video Methods	Assignment
CO 2	कहानियां छात्रों की कल्पना और जिज्ञासा को जगाने में मदद करती हैं।	Case studies	Group Project
CO 3	व्याकरण हिंदी भाषा को सही ढंग से बोलने, लिखने और समझने में मदद करता है। विज्ञापन लेखन और कहानी लेखन छात्रों को उनके रचनात्मक लेखन और कल्पना शक्ति को विकसित करने में मदद करेगा।	Lectures / Video Lessons	Seminar
CO 4	अनुवाद सभी लोगों के बीच प्रभावी संचार को सक्षम बनाता है।	Lecture / Video Methods	Assignment
CO 5	गद्यांश लेखन लिखित पाठ के सार को समझने और संदर्भ के आधार पर आपके निष्कर्षों का अनुमान लगाने में आपकी बुद्धिमत्ता का आकलन करता है।	Lecture / Dumb Charades	Seminar

Offered by	Hindi

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	नाटक लड़ाई - 1979 - सर्वेश्वर दयाल सक्सेना	1	All
		Instructional Hours	12
Suggested Learning Methods : Visual Learning			
II	कहानी - 1. मजबूरी' - मन्नू भंडारी 2. ठाकुर का कुआँ - मुंशी प्रेमचंद 3. चीफ की दावत - भीष्म साहनी 4. भोलाराम का जीव -हरिशंकर परसाई	1	1 to 4
		Instructional Hours	12
Suggested Learning Methods : Auditory			

III	1. अनुप्रयुक्त व्याकरण - संज्ञा, सर्वनाम, क्रिया और विशेषण की पहचान करना। 2. विज्ञापन लेखन **3.** दिए गए संकेतों से कहानी लेखन।	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
IV	अनुवाद : अंग्रेज़ी से हिंदी (अनुवाद अभ्यास - 3) 1 - 10 अनुच्छेद	3	1,2
		Instructional Hours	12
Suggested Learning Methods : Auditory, Visual			
V	पारिभाषिक शब्दावली , गद्यांश लेखन	5	1,2
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Text Books	1. नाटक लड़ाई - 1979 - सर्वेश्वर दयाल सक्सेना 2. 2. कहानी संग्रह 3. अनुवाद अभ्यास - 3 दक्षिण भारत हिंदी प्रचार सभा , चेन्नई -17 4. Bharatdarshan.co.nz 5. भाषाशास्त्र का पारिभाषिक शब्द कोश - राजेंद्र द्विवेदी 6. श्री रामदेव , व्याकरण प्रदीप, लोक भारती प्रकाशन, इलाहाबाद
Reference Books	संदर्भ ग्रंथ 1. हिंदी नाटक और रंगमंच - डॉ राम कुमार वर्मा 2. हिन्दी अलोचना की परीभाषिक शब्दावली - पेपरबैंक 3. आधुनिक हिंदी व्याकरण और रचना - डॉ. वासुदेव नंदन प्रसाद
Web. URLs	

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Group project	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	M	L							
CO2	-	-	H	L	L	H							
CO3	-	-	-	L	M	H							
CO4	-	-	M	M	H	L							
CO5	-	-	L	M	H	L							

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Swarnalatha	Dr. S. Swarnalatha

Course Code			
23U1MAL101	Part : I - Kadhayum Samskaaravum (കഥയും സംസ്കാരവും)		
Semester : I	Credits : 3	CIA : 20 Marks	ESE : 55 Marks

(Common to all UG Programmes)

Course Objective	ആധുനികകാലത്തെ മലയാളകഥകളെ കുറിച്ചും സംസ്കാരത്തെ കുറിച്ചും അവബോധം ഉണ്ടാക്കുന്നു
Course Category	Skill Development
Development Needs	Regional
Course Description	Improved accuracy & quality, improved communication

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	കഥയുടെ സംവേദനം ആസ്വാദകന്റെ അഭിരുചിയെ പൂർത്തിയാക്കുന്നു	Lecture / Video Methods	Assignment
CO 2	പ്രകൃതിയുമായി ബന്ധപ്പെടുന്ന കഥാപരിസരം	Case studies	Group Project
CO 3	ഭക്ഷണവും അതിന്റെ സംസ്കാരവും കൂട്ടായ്മ ഉണ്ടാക്കുന്നു	Lectures / Video Lessons	Seminar
CO 4	ഭക്ഷണത്തിന്റെ മൂല്യം അർത്ഥവത്താക്കുന്നു	Lecture / Video Methods	Assignment
CO 5	ആശയ വിപുലനം	Lecture / Dumb Charades	Seminar

Offered by : **Malayalam**

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	ചെറുകഥകൾ - സമകാലിക കഥകൾ 1. പരുന്ത് - ഇ.സന്തോഷ്കുമാർ 2. പാലാഴിമഥനം - കെ.രേഖ 3. കുളവാഴ - വി .എം .ദേവദാസ് 4. മരണമുണ്ടാക്കിക്കളിക്കാം - പി .വി ഷാജികുമാർ 5. കക്കുകളി - ഫ്രാൻസിസ് നൊറോണ	1	1 to 5
		Instructional Hours	**12**
Suggested Learning Methods : Visual Learning			
II	നവോത്ഥാനകഥകൾ 1. വെള്ളപ്പൊക്കത്തിൽ - തകഴി 2. ബസു യാത്ര - കേശവദേവ് 3. മരപ്പാവകൾ - കാരൂർ 4. മാണിക്കൻ - ലളിതാംബിക അന്തർജനം 5. ജന്മദിനം - ബഷീർ	1	6 to 10
		Instructional Hours	**12**
Suggested Learning Methods : Auditory			

III	സംസ്കാര പഠനം - കേരളത്തിലെ രുചിഭേദങ്ങൾ 1. കാസർകോടും കന്നയാളവും ദൈവവിപ്ലവത്തിന്റെ കണ്ണൂരും 2. സാമൂതിരി ,മുട്ടമാല ,എരന്ത് ,ബ്രാഹ്മണാൾ - (കോഴിക്കോട്) 3. മലപ്പുറം കേരളത്തിൻറെ അറേബ്യ	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
IV	സംസ്കാര പഠനം - കേരളത്തിലെ രുചിഭേദങ്ങൾ 1. ചേട്ടായിയെ ഇത് ശൂരാട്ടാ - തൃശ്ശൂർ 2. കരിമ്പനകളുടെ നാട്ടിൽ - പാലക്കാട്	1	4,5
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual			
V	നവമാധ്യമങ്ങൾ - വിവർത്തനം	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Text Books	1. ചെറുകഥകൾ - (10 ചെറുകഥകൾ) 2. സംസ്കാര പഠനം - നാടൻ കേരള എക്സ്പ്രസ്സ് ഡോ.സി. ഗണേഷ്, ഗ്രീൻ ബുക്ക്സ് തൃശ്ശൂർ 3. നവമാധ്യമങ്ങൾ - ടി.കെ .സന്തോഷ്കുമാർ ഡി.സി.ബുക്ക്സ് കോട്ടയം
Reference Books	1. എം. അച്യുതൻ - ചെറുകഥ ഇന്നലെ ഇന്ന് - ഡി.സി.ബുക്സ് കോട്ടയം 2. ചെറുകഥയുടെ ഛന്ദസ്- വി. രാജകൃഷ്ണൻ മാതൃഭൂമി ബുക്സ് കോഴിക്കോട് 3. പുതിയ കഥ പുതിയ വായന - എഡി : ഡോ.ഷീബാ ദിവാകരൻ പുസ്തകലോകം പ്രസദ്ധീകരണം കോഴിക്കോട് 4. കേരള സംസ്കാരം - എ .ശ്രീധര മേനോൻ നാഷണൽ ബുക്ക്സ് കോട്ടയം 5. ന്യൂസ് റൂമിന്റെ അകവും പുറവും - ബി.ആർ .പി.ഭാസ്കർ ഗ്രീൻ ബുക്ക്സ് തൃശ്ശൂർ
Web. URLs	**http://www.keralaculture.org>literature**

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Group project	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-					
CO2	-	-	H	L	H	M	-	-					
CO3	-	-	-	M	M	H	-	-					
CO4	-	-	L	M	L	H	-	-					
CO5	-	-	L	-	H	-	-	-					

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. N. Rajini	Dr. Smitha C R

Course Code	Title		
23U1FRN101	Part - I : Le Français Fondamental - I		
Semester : I	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	Acquisition of standard French through fundamental French grammar.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	This course has basic knowledge of the French grammar and aims to build a solid foundation in the acquisition of standard French through fundamental French grammar		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Learn basic French grammar along with French civilisation	Lecture	Assignment
CO 2	Knows the gender of nouns	Word game/ Lecture	Seminar
CO 3	Learn Negation, articles, and understand the usage of prepositions.	Lectures / Video Lessons	Quiz
CO 4	Learn Futur proche, Pronominal verb,	Tutorial / Case Studies	Assignment
CO 5	Know to self-introduce and translate simple sentences	Lecture /	Group project

Offered by	French

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	Mes cinq sens en action	1	0
	Instructional Hours		12
Suggested Learning Methods: Worksheets , Reading practice			
II	S'ouvrir aux autres	1	1
	Instructional Hours		12
Suggested Learning Methods: Kahoot App, Worksheets			
III	Partager son lieu de vie	1	2
	Instructional Hours		12
Suggested Learning Methods : Audio & Visual, Speaking practice			
IV	Vivre au quotidien	1	3
	Instructional Hours		12
Suggested Learning Methods : Comprehensive Writing			

V	S'ouvrir à la culture	1	4
		Instructional Hours	**12**
Suggested Learning Methods: Translating simple sentences, comprehending the passage.			
		Total Hours	**60**
Text Books	Saison 1 Méthode de Français – Marie-Noëlle Cocton, Anouchka De Oliveira, Dorothée Dupleix (Unit 0 to 4)		
Reference books	A1 Echo Méthode de Français		
Web. URLs	Lingua.com, TV 5 app,		

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-	-	-	-	-	-
CO2	-	-	H	L	H	M	-	-	-	-	-	-	-
CO3	-	-	-	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	M	L	H	-	-	-	-	-	-	-
CO5	-	-	L	-	H	-	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Malathi	Dr. S. Malathi

Course Code	Title		
23U2ENG101	Part – II : Professional English – I		
Semester : I	Credits : 3	CIA : 20 Marks	ESE : 55 Marks

(Common to all UG Programmes)

Course Objective	To help students to imbibe, develop, practice and use the LSRW skills and fine tune their productive skills.
Course Category	Skill Development
Development Needs	Global
Course Description	SD: Helps to develop LSRW skill

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Recognize listening, and reading proficiency through the prose discourses.	Lecture/Tutorial	Assignment
CO 2	Use and interpret imaginative, and creative skills through the poetic genre.	Lecture/Tutorial	Assignment
CO 3	Enhance the students to use English effectively through short story.	Lecture/Tutorial	Speaking
CO 4	Execute and exercise grammatical skills in academics and career.	Lecture/Tutorial	Reading
CO 5	Evaluate the LSRW skills through literature.	Lecture/Tutorial	Writing

Offered by | **Department of English**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	**Prose** Leigh Hunt – Getting Up On Cold Morning Rajagopalachari – Tree Speaks A.G. Gardiner – On the Rule of the Road **Listening Activity** – Comprehension practice from Prose.	1	1-3
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			
II	**Poetry** John Milton – On His Blindness Maya Angelou -Phenomenal Women A. K. Ramanujan – A River **Speaking Activity** – Group Discussion Forum	1	4-6
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			

III	**Short Stories** O. Henry – The Last Leaf R. K. Narayan – The Missing Mail Oscar Wilde - The Happy Prince **Reading Activity** – Pronunciation practice and enhancement from Short-stories	1	7-9
		Instructional Hours	**12**
Suggested Learning Methods : Tutorial			
IV	**Grammar** Parts of Speech Tenses Kinds of Sentences **Writing Activity** – Paragraph Writing using grammar Components	1	10-13
		Instructional Hours	**12**
Suggested Learning Methods : Tutorial			
V	**Writing Skills** Letter Writing (Formal & Informal) Notice, Writing Circular Memo, Advertisement Minutes of the Meeting	1	14-17
		Instructional Hours	**12**
Suggested Learning Methods : ABL			
		Total Hours	**60**

Text Books	Compiled by the Department of English, NASC.
Reference Books	CLIL (Content & Language Integrated Learning) – Module by TANSCHE NOTE: (Text: Prescribed chapters or pages will be given to the students by the department and the college)
Web. URLs	https://www.youtube.com/watch?v=QrUPneyZNf0

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Speaking	Reading	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	H	L	M	M	H	M	H	H	M	H	M
CO2	M	L	H	L	H	M	H	M	H	H	M	H	M
CO3	M	L	H	L	H	H	H	H	H	H	M	H	M
CO4	M	L	H	L	H	L	H	H	H	H	M	H	H
CO5	H	M	H	L	H	H	H	H	H	H	H	H	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. D. Pradeek	Dr. R. Malathi

Course Code	Title		
23U3MBC101	Core Paper I – Fundamentals of Microbiology		
Semester: I	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	This subject aims to introduce the history and development of Microbiology. The contents of this course will help students understand history, biology of microorganisms, growth and control of microbes. Thus, the beginners are rightly exposed to foundation of Microbiology which would lead them towards progressive advancement of the subject.
Course Category	Employability
Development Needs	Global
Course Description	Students will be able to explain the processes used by microorganisms for their replication, survival, interaction with their environment, hosts and host populations.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Get an idea about the historical events and diversity in Microbiology	Lecture	Assignment
CO 2	Acquaint with various sterilization techniques and use various method to control microbes	Lecture / Demonstration	Seminar
CO 3	Understand different types and principle techniques in Microscopy	Lectures / Video Lessons	Quiz
CO 4	Understand different methods of staining and culture techniques	Tutorial / Videos	Seminar
CO 5	Describe the Estimation, Maintenance and Preservation	Lecture / Group Discussion	Quiz

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week: 5**

Unit	Description	Text Book	Chapters
I	**History and Scope of Microbiology**: Spontaneous generation theory- conflict. Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, John Tyndall.	1	1
		Instructional Hours	**15**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Sterilization and Disinfection**: Principles- Methods of Sterilization – Physical methods – Dry heat- Moist heat, Filtration (Membrane & HEPA) - Radiation – Chemical Sterilization -Chemical agents Mode of action. Sterility testing. Phenol coefficient test	1	22-24
		Instructional Hours	**15**
Suggested Learning Methods: Demonstration			
III	**Microscop**y: Bright field: - Dark Field - Phase contrast and Fluorescence microscope. Electron Microscope - Specimen preparation -TEM and SEM. Atomic Force Microscope	3	2
		Instructional Hours	**15**

Suggested Learning Methods: Demonstration			
IV	**Culture media & Staining techniques:** Media preparation: Media and its Types, Pure culture technique – Tube dilution, Pour, Spread, Streak plate. Anaerobic culture technique – Wright's tube, Roll tube, Mclntostfildes jar method. Staining Technique - Simple, Gram, Negative, Acid Fast, Endospore, LCB.	2 & 3	3 & 2, 5, 6
		Instructional Hours	**15**
Suggested Learning Methods: Videos and Hands on training			
V	Direct Microscopic count, Turbidometric assay, TVC- Indirect Method- CO_2 liberation. Maintenance and Preservation - Short term – Slant, Stab, Mineral oil overlay - Long term – Lyophilization, Cryopreservation, Storage in sterile soil, Storage in silica gel.	3	6
		Instructional Hours	**15**
Suggested Learning Methods: Laboratory practice / You tube Videos			
		Total Hours	**75**

Text Books	1. Pelczar MJ, Chan ECS and Kreig NR. **Microbiology**, 5th edition, Tata McGraw Hill- Hill Education Pvt. Ltd., New Delhi, 2012. 2. Dubey RC and Maheswari D K. **A Textbook of Microbiology**, Revised Multicolour Edition. S Chand and Company Limited, New Delhi, 1999. 3. Prescott, Harley, and Klein's. **Microbiology**, 7thedition McGraw-Hill, 2008.
Reference Books	1. Presscott, L.M., J.P. Harley and D.A. Klein. **Microbiology**, 6th edition, TATA McGraw Hill, New Delhi.2005. 2. Alcamo, E. **Fundamentals of Microbiology**, 6th edition. Jones and Bartlett Publishers, New Delhi. 2001 3. Salle, A.J. **Fundamentals and Principles of Bacteriology**, 7th edition. Tata MC Graw Hill, New Delhi.2001. 4. Brooks, G.F., E. Jawetz, J.L. Melnick and E.A. Adelberg. **Medical Microbiology.** 5. 26thedition, New York: McGraw Hill Medical. 2013. 6. Patricia, M.T. **Bailey and Scott's Diagnostic Microbiology**,13thEedition, Mosby, Inc. Publishers, China. 2014.
Web. URLs	http://www.nptel.ac.in/courses/102103015/pdf/mod3.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PSO 1	PSO2	PSO 3	PSO 4	PSO 5
CO1	M	L	M	M	M	M	L	H	H	H	M	L	L
CO2	H	H	M	L	H	H	L	H	H	H	M	L	L
CO3	H	H	M	L	H	H	L	H	H	H	M	L	H
CO4	H	H	L	H	L	H	L	H	H	H	H	L	L
CO5	M	H	L	H	H	L	L	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Dinesh M. D	Dr. M. Thangavel

Course Code	Title		
23U3MBC102	Core paper II – Cell Biology		
Semester: I	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To introduce the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, organelles, transport mechanisms and cellular components underlying mitotic cell division**.**
Course Category	Skill Development
Development Needs	Global
Course Description	Students can able to explain prokaryotic cell, eukaryotic cell, transport mechanism, cell division and cell cycle of bacteria.

Course Outcomes		**Teaching Methods**	**Assessment Methods**
CO 1	Know characteristics and basic structure of prokaryotic cell.	Lecture	Assignment
CO 2	Understand organization and structure of eukaryotic cell.	Videos, Tutorial	Seminar
CO 3	Distinguish transport mechanisms of cell.	Lectures	Quiz
CO 4	Identify concepts of cell division in bacteria.	Lectures	Assignment
CO 5	Explain basic concepts of cell cycle, death mechanism and stem cells.	Lectures, Videos	Seminar

Offered by | **Microbiology**

Course Content	**Instructional Hours / Week: 5**

Unit	Description	Text Book	Chapters
I	**Ultrastructure of Eubacteria**: Cell membrane- Extra mural layer - Slime – Capsule. Cytoplasmic inclusions – Mesosomes –Nuclear material, Reserve materials. Capsule, slime layer, flagella and pili. Ultra structure of algae, Cyanobacteria, protozoa, fungi	**1**	1,2
		Instructional Hours	**15**
Suggested Learning Methods: Video lectures			
II	**Ultrastructure and functions of cells:** Cell wall – Cell membrane -Mitochondria – Chloroplast – Endoplasmic reticulum –Golgi complex – Nucleus –Ribosomes, Other cell inclusions and Flagella	1,2	3,4,5,9
		Instructional Hours	**15**
Suggested Learning Methods: You tube videos			
III	**Transport mechanisms**: Diffusion - Facilitated diffusion. Active transport-Group translocation–phagocytosis–Pinocytosis-Sodium Potassium and Osmosis Regulations of cell	1	6,7,8
		Instructional Hours	**15**
Suggested Learning Methods: Animations and Videos			

IV	**Cell division in Bacteria:** Binary fission– Mitosis and Meiosis. Cell division in Fungi and Eukaryotes	2	8
		Instructional Hours	**15**
Suggested Learning Methods: Videos			
V	**Cell Cycle:** Eukaryotic cell cycle and its regulation. Development of cancer, causes and types Programmed cell death, Stem cells - Embryonic stem cellsinduced pluripotent stem cells	1	13,17
		Instructional Hours	15
Suggested Learning Methods: Lectures and Videos			
		Total Hours	**75**

Text Books	1. Pelczar MJ, Chan ECS and Kreig NR. **Microbiology**, 5th edition, Tata McGraw Hill-Hill Education Pvt., Ltd., New Delhi, 2008. 2. Joanne M.Willey, Linda M. Sherwood, Christopher J. Woolverton, **Prescott, Harley and Klein's Microbiology**, 7th Edition, McGraw Hill Edition, 2008. 3. Ivan M.Roitt's& Peter J Delves. **Essential of Immunology**, 10thedition, BlackwellScience, UK, 2011.
Reference Books	1. Stainer R.Y. Ingraham J.L. Wheolis H.H and Painter P.R., **The Microbial World**, 5thedition, Eagle Works Cliffs N.J. Prentice Hall, 1986. 2. Jain V.K. Fundamentals of Plant **Physiology**,5th edition, S. Chand & Co Ltd., New Delhi,2000.
Web. URLs	https://microbiologyinfo.com/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	H	H	H	L	M	M	L	M	M	H	H	M	M
CO2	M	M	M	M	H	M	M	M	H	H	H	M	H
CO3	H	L	M	H	M	M	L	H	M	H	H	M	M
CO4	M	H	L	M	L	L	H	M	H	M	H	H	M
CO5	M	M	H	H	M	H	M	H	H	H	M	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Thulasi Sivaraman	Dr. M. Thangavel

Course code	Title		
23U3BYA101	Allied Paper I – Biochemistry		
Semester: I	Credits: 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective	Understand the concept of Biochemistry regarding Biomolecules-Carbohydrates, proteins, lipids, Enzymes
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	Study of proteins, enzymes, carbohydrates, lipids and nucleic acids in relationship to biological and metabolic processes

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Know about the basic Biomolecules present inside the body.	Lecture / Flipped Classroom	Assignment
CO 2	Understand the basic structure of lipids and its importance.	Lecture / Tutorial	Seminar
CO 3	Recognize the basic structure of amino acid and proteins and their role in metabolic pathways.	Lecture / Video Lessons	Quiz
CO 4	Gain knowledge on Nucleic acids, vitamins and vitamin deficiency diseases.	Tutorial / Case Studies	Quiz
CO 5	Explain the Principle, operation and applications (Biochemical) of various laboratory instruments.	Lecture / Demonstration	Assignment

Offered by | **Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**pH and Buffers**: Concept of acid base indicators, Concept of pH and components of the pH meter. Buffer systems of Blood. Laws of thermodynamics. **Carbohydrates**: Introduction, classification, Structure and importance of monosaccharide, disaccharides, polysaccharides. Homopolysaccharides and heteropolysaccharides.	1	5 - 8
	Instructional Hours		**12**
Suggested Learning Methods: Group Learning			
II	**Lipids:** Introduction, classification, physical properties and chemical properties of fats and oils. Structure and importance of saturated and unsaturated fatty acids. Classification and Significance of lipoproteins and phospholipids.	1	12 - 14
	Instructional Hours		**12**
Suggested Learning Methods: Chart Preparation			
III	**Amino acids and Proteins**: Amino acids-classification and properties. Protein– classification, Structure and properties. **Enzymes: C**lassification, General properties of enzymes (pH, Temperature, Substrate concentrations)	1 2	9 – 114 21 - 22
	Instructional Hours		**12**
Suggested Learning Methods: You tube Videos			

IV	**Nucleic acids** – Components, Types of nucleic acids, Double helical structure of DNA- Nucleic acid denaturation. **Vitamins**: Introduction, properties, functions. Deficiency diseases of fat soluble and water-soluble vitamins, biochemical roles, Daily requirement.	2	5
		Instructional Hours	**12**
Suggested Learning Methods: Lecture / You tube Videos			
V	**Colorimetry and spectrophotometry:** Beer-Lambert's law, light absorption and its transmittance. **Centrifugation**: Basic principles of sedimentation, types of centrifugations, types of centrifuges. **Chromatography:** Paper and TLC, their applications. **Electrophoresis:** Principle, technique, AGE, SDS -PAGE.	1 1	35 40
		Instructional Hours	**12**
Suggested Learning Methods: Group Discussion / Demonstration			
		Total Hours	**60**

Text Books	1. Jain,J.L. **Fundamentals of Biochemistry**. New Delhi:S.Chand,2004. 2. Shanmugam,A. **Ambika Shanmugam's Fundamentals of Biochemistry for Medical Students**. NewDelhi: 3. Wolters Kluwer Health/Lippincott Williams & Wilkins, 2016.
Reference Books	1. Lehninger, A.L Nelson, D. L & Cox, M. M. **Principles of Biochemistry**. New York: W.H. Freeman, 2013. 2. Murray. R.K. **Harper's Biochemistry**. New York: McGraw-Hill,2003. 3. Chatterjee. M. N & Shinde, R. **Textbook of Medical Biochemistry**. New Delhi: Jaypee Brothers Medical (P). 2013. 4. Deb, A. C. **Fundamentals of Biochemistry**. London: New Central Book Agency,2011.
Web. URLs	https://themedicalbiochemistrypage.org/category/foundational-biochemistry/

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	6	2	2	2	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO5
CO1	H	H	M	M	M	M	H	L	L	L	H	M	M
CO2	M	H	M	H	H	H	H	M	M	L	M	H	M
CO3	H	H	H	M	M	H	L	M	H	M	M	H	L
CO4	H	M	L	M	H	H	H	M	M	H	L	H	M
CO5	M	H	H	H	H	M	L	H	H	H	H	M	L

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. Dinesh. M. D	Dr. M. Thangavel

Course Code	Title	
21U4ENV101	Ability Enhancement Compulsory Course - Environmental Studies	
Semester: I	Credits: 2	CIA: 50 Marks

(Common to all UG Programmes)

Course Objective:

This course enables the students to recognize the interconnectedness of multiple factors in environmental challenges and communicate clearly and competently matters of environment concern.

Course Outcomes:

On completion of course the students will be able to

CO 1	Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
CO 2	Understand concepts and methods from ecological and physical sciences and their application in environmental problem solving.
CO 3	Solve the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO 4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO 5	Apply systems concepts and methodologies to analyse and understand interactions between social and environmental processes.

Course Content **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapter
I	**Natural Resources:** Forest resources, Water resources, Mineral resources, Food resources, Energy resources and Land resources.	1	2
	Instructional Hours		**6**
II	**Ecosystems:** Concept of an ecosystem, Structure and function; Introduction, types, characteristic features, structure and function of ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). **Activity: Prepare an album on types of Ecosystem.**	1	3
	Instructional Hours		**6**
III	**Environmental Pollution:** Definition Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution and Noise pollution, Solid waste management. **Activity: Discuss the solutions for water pollution**	1	5
	Instructional Hours		**6**
IV	**Social Issues and the Environment:** Water conservation, rain water harvesting, watershed management, Environmental ethics - Issue summits' and possible solutions and Public awareness. **Activity: Identify and analyse a Social Issue and an Environment issue in your locality.**	1	6
	Instructional Hours		**6**

V	**Disaster Management:** Floods, Earthquakes, Cyclones, Landslides: From management to mitigation of disasters: The main elements of a mitigation and measures of strategy: Floods, Earthquakes, Cyclones and Landslides	2	16
		Instructional Hours	**6**
Field Work: Visit to local area to document Environmental assets (River / Forest / Grass land / Mountain), Visit to local polluted site (Urban / Rural /industrial / Agricultural), Study of common plants, insects, birds, Study of simple ecosystem: Pond, River, Hill slopes.			
		Total Hours	**30**

Text Book(s):

1. Shashi Chawla. A Text Book of Environmental Studies, Tata McGraw-Hill, 2012.
2. From UGC website: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

Reference Book(s):

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd., Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995 Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
3. Mckinney, M.L. & Schoch R.M. 1996. Environmental Science systems & Solutions
4. Odum, E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p
5. Rao MN & Datta, A.K. 1987 Waste Water treatment, Oxford & IBH Publication Co. Pvt. Ltd., 345 p.

Tools for Assessment (50 Marks)

Ecosystem Album Preparation	Field visit and report submission	Group discussions about issues related to their locality / about Disaster Management	CIA	Total
10	10	5	25	50

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	-	L	H	H	H	H	L	L	H	H	H	H
CO2	L	-	L	H	H	H	H	L	L	H	H	H	H
CO3	L	-	L	H	H	H	H	L	L	H	H	H	H
CO4	L	-	L	H	H	H	H	L	L	H	H	H	H
CO5	L	-	L	H	H	H	H	L	L	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by	Checked by	Approved by Chairman
			Dr. M. Thangavel

SEMESTER – II

Course Code	Title		
23U1TAM202	Part - I : Pynthamizh (பைந்தமிழ்)		
Semester: II	Credits: 3	CIA: 20 Marks	ESE: 55 Marks
Course Objective	மொழி இலக்கியத்தின் வாயிலாக அறம் சார் பண்பு மற்றும் ஆளுமை மிக்க மாணவர்களை உருவாக்குதல்.		
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)		
Development Needs	Global /Regional(உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)		
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல் மற்றும் உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	பக்தி இலக்கியங்கள் வழி வாழ்வியல் நெறிகளை மாணவர்களுக்கு எடுத்துரைத்தல்	விரிவுரை/காணொளிப்பட விளக்கம்	ஒப்படைவு
CO 2	சிற்றிலக்கியங்களின் மூலம் தமிழர்களின் வாழ்க்கை கூறுகளை எடுத்துரைத்தல்	விரிவுரை	குழுத்திட்டம்
CO 3	தமிழ் நாவல்களின் வழி சமுதாயச் சிந்தனைகளைக் கூறுதல்	விரிவுரை/காணொளிப்பட விளக்கம்	கருத்தரங்கு
CO 4	இலக்கண அறிவை வளர்த்தல்	விரிவுரை	ஒப்படைவு
CO 5	தமிழ் இலக்கிய வரலாற்றுத்திறனை மேம்பாடு அடையச் செய்தல்	விரிவுரை/ குழு விவாதம்	கருத்தரங்கு

Offered by தமிழ்த்துறை

Course Content: Pynthamizh (பைந்தமிழ்) — **Instructional Hours / Week : 4**

Unit	Description		Text Book & Chapters
I	பக்தி இலக்கியங்கள்	1. திருமந்திரம் - மூன்றாம் தந்திரம் (அதிகாரம் 2) 2. நாலாயிரத் திவ்வியப்பிரபந்தம்- பெரியாழ்வார் 3. மாணிக்கவாசகர்-எட்டாம் திருமுறை 4. திருநாவுக்கரசர்- திருவரங்கமாலை	அட்டமாசித்திகள் திருப்பல்லாண்டு அச்சோப்பதிகம் நான்காம் திருமுறை - தேவாரம்
		Instructional Hours	**12 Hours**
Suggested Learning Methods: ஆன்மிக சிந்தனைத்திறன் பெற்றமை			
II	சிற்றிலக்கியங்கள்	1. கலம்பகம் - நந்திக்கலம்பகம் 2. பள்ளு – முக்கூடற்பள்ளு 3. குறவஞ்சி – திருக்குற்றாலக்குறவஞ்சி 4. பிள்ளைத்தமிழ் - மீனாட்சியம்மை பிள்ளைத்தமிழ் 5. பட்டினத்தார் பாடல்கள்	91 -100 பாடல்கள் 350 - 360 செய்யுள்கள் 1-10 செய்யுள்கள் 1 -10 செய்யுள்கள் 358 - 367 பாடல்கள்
		Instructional Hours	**12 Hours**
Suggested Learning Methods : கலந்துரையாடல்			
III	நாவல்	1. இமையம் (வெ.அண்ணாமலை)	செல்லாத பணம்
		Instructional Hours	**12 Hours**
Suggested Learning Methods : நாவல் எழுதும் திறன் பெற்றமை			

IV	இலக்கணம்	1. வல்லினம் மிகும் இடங்கள் 2. வல்லினம் மிகா இடங்கள் 3. யாப்பின் உறுப்புகள் (எழுத்து முதல் தொடை வரை) 4. பாவின் வகைகள்	தமிழ் இலக்கணம்
		Instructional Hours	**12 Hours**
Suggested Learning Methods : பிழையின்றி தமிழ் எழுதுதல்			
V	தமிழ் இலக்கிய வரலாறு	1. சிற்றிலக்கியத்தின் தோற்றமும் வளர்ச்சியும் 2. புதினத்தின் தோற்றமும் வளர்ச்சியும் 3. பக்தி இலக்கியத்தின் தோற்றமும் வளர்ச்சியும் 4. விண்ணப்பங்கள், மடல்கள் எழுதச்செய்தல்	தமிழ் இலக்கிய வரலாறு
		Instructional Hours	**12 Hours**
Suggested Learning Methods : குழு விவாதம்			
		Total Hours	**60 Hours**

Text Books	1. இளங்கலை முதலாம் ஆண்டுத்தமிழ் மாணவர்களுக்குரிய பாடநூல் "பைந்தமிழ்" தொகுப்பு: தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.
Reference Books	1. திருமந்திரம் - மாணிக்கவாசகர் அருளிய திருவாசகம் - சித்தாந்த பண்டிதர் திரு.ப.இராமநாத பிள்ளை விளக்க உரையுடன் கழக வெளியீடு, திருநெல்வேலி, 2. தமிழண்ணல - புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சிப் புத்தக நிலையம் மதுரை.
Web. URLs	https://youtu.be/cL89sSZq_FI

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
4	4	5	2	2	3	20

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	**L**	H	L	H	H	M	H					
CO2	H	**L**	M	L	H	L	H	H					
CO3	H	**L**	L	L	M	M	H	H					
CO4	H	**L**	H	L	H	M	M	L					
CO5	H	**L**	H	L	H	L	H	H					

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. S. Satheesh kumar	Dr. A.Sridevi

Course Code	Title		
23U1HIN202	Part – I : Sanchar Hindi		
Semester : II	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	पाठ्यक्रम संवादी हिंदी में पारंगत होने में मदद करता है।		
Course Category	Skill Development		
Development Needs	Regional		
Course Description	Improved accuracy & quality, improved communication		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	कविता की मूल शब्दावली और व्यावहारिक तत्वों को समझें। मुक्त छंद और कविता के पारंपरिक रूपों में अंतर्निहित सामान्य तकनीकों को समझें।	Lecture / Video Methods	Assignment
CO 2	छात्र विभिन्न प्रकार की संवादात्मक स्थितियों में हिंदी में प्रदर्शित करने, चित्रित करने, नाटक करने और व्याख्या करने के लिए अर्जित कौशल को लागू करने में सक्षम होंगे	Case studies	Group Project
CO 3	छात्र औपचारिक और अनौपचारिक पत्र लिखने में सक्षम होंगे।	Lectures / Video Lessons	Seminar
CO 4	अनुवाद सभी लोगों के बीच प्रभावी संचार को सक्षम बनाता है।	Lecture / Video Methods	Assignment
CO 5	छात्र हिंदी भाषा के वक्ता के साथ किसी भी सामान्य विषय पर विभिन्न स्तरों पर बातचीत करने में सक्षम होंगे ।	Lecture / Dumb Charades	Seminar

Offered by	Hindi

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	आधुनिक हिंदी काव्य : रश्मिरथी , रामधारी सिंह 'दिनकर'	1	All
		Instructional Hours	12
Suggested Learning Methods : Visual Learning			
II	एकांकी संग्रह : 1. शिवाजी का सच्चा स्वरूप - (सेठ गोविंददास) 2. औरंगजेब की आखिरी रात - रामकुमार वर्मा 3. रीढ़ की हड्डी - (जगदीशचंद्र माथुर) 4. सिपाही की माँ - (मोहन राकेश	1	1 to 4
		Instructional Hours	12
Suggested Learning Methods : Auditory			

III	पत्र लेखन : (छुटटी पत्र , संपादक को पत्र , पुस्तकों के लिए आदेश पत्र , नौकरी के लिए आवेदन पत्र , निजी पत्र)	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
IV	अनुवाद : हिंदी से अंग्रेजी (अनुवाद अभ्यास - 3) 1 – 10 passages	3	1,2
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual			
V	बोलचाल की हिन्दी : 1. शिक्षक - विद्यार्थी 2. ग्राहक-दुकानदार 3. डॉक्टर - रोगी, 4. साक्षात्कार 5. दो यात्री 6. माँ - बेटा	5	1,2
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Reference Books	1. रश्मिरथी / रामधारी सिंह "दिनकर" - कविता कोश 2. सरस एकांकी नाटक : डॉ. रामकुमार वर्मा 3. अनुवाद अभ्यास - 3 दक्षिण भारत हिंदी प्रचार सभा , चेन्नई -1
Reference Books	1. श्रेष्ठ हिन्दी एकांकी -डॉ विजयपाल सिंह 2. बोलचाल : पं० अयोध्या सिंह उपाध्याय 3. हिंदी व्याकरण निबंध और पत्र लेखन -डॉ. एन. एल. माथुर
Web. URLs	**www.webdunia.com**

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Group project	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	L	M	-	-					
CO2	-	-	H	L	H	H	-	-					
CO3	-	-	L	L	M	H	-	-					
CO4	-	-	M	M	L	L	-	-					
CO5	-	-	L	M	M	M	-	-					

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Swarnalatha	Dr. S. Swarnalatha

Course Code			
23U1MAL202	Part – I : Novalum Bhashaapadanavum		
Semester : II	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	വിദ്യാർത്ഥികളിൽ മലയാള ഭാഷയുടെ വികാസവും മലയാള സാഹിത്യത്തിൽ നോവലുകൾക്കുള്ള സ്ഥാനവും വായനാശീലവും വർദ്ധിപ്പിക്കുന്നു		
Course Category	Skill Development		
Development Needs	Regional		
Course Description	Proper guidance, opportunities and encouragement that help them achieve their ambitions		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	സമൂഹത്തിലെ ഒരു വിഭാഗത്തിന്റെ ജീവിതം	Lecture / Video Methods	Assignment
CO 2	പ്രകൃതിയുടെയും മറ്റു ജീവജാലങ്ങളുടെയും മാറ്റങ്ങൾ	Case studies	Group Project
CO 3	പ്രകൃതി നാശത്തിനെതിരായി ഒന്നിച്ചു പ്രവർത്തിക്കുന്നു	Lectures / Video Lessons	Seminar
CO 4	സമൂഹത്തിലെ ഭാഷാസങ്കല്പം തിരിച്ചറിയുന്നു	Lecture / Video Methods	Assignment
CO 5	നല്ല ഭാഷ എങ്ങനെ സൃഷ്ടിക്കാമെന്ന് മനസ്സിലാക്കുന്നു	Lecture / Dumb Charades	Seminar

Offered by Malayalam

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	നോവൽ - എൻമകജെ	1	1 to 16
		Instructional Hours	**12**
Suggested Learning Methods : Visual Learning			
II	നോവൽ - എൻമകജെ	1	17 to 34
		Instructional Hours	**12**
Suggested Learning Methods : Auditory			
III	നോവൽ - എൻമകജെ	1	35 to 51
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
IV	ഭാഷാപഠനം - തെളിമലയാളം	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual			

V	ഭാഷാപഠനം - തെളിമലയാളം	1	4,5
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**
Text Books	1. അംബികാസുതൻ മാങ്ങാട് - എൻമകജെ - ഡി.സി.ബുക്സ് കോട്ടയം 2. എം.എൻ.കാരശ്ശേരി - തെളിമലയാളം - ഡി.സി.ബുക്സ് കോട്ടയം		
Reference Books	1. പ്രൊഫ.എൻ.കൃഷ്ണപ്പിള്ള - കൈരളിയുടെ കഥ - ഡി.സി.ബുക്സ് കോട്ടയം 2. ഡോ. പന്മന രാമചന്ദ്രൻ നായർ - സമ്പൂർണ്ണമലയാള സാഹിത്യ ചരിത്രം - ഡി.സി.ബുക്സ് കോട്ടയം 3. ഡോ.കെ.എം. ജോർജ് - ആധുനിക മലയാള സാഹിത്യ ചരിത്രം പ്രസ്ഥാനങ്ങളിലൂടെ - ഡി.സി.ബുക്സ് കോട്ടയം 4. എരുമേലി - മലയാള സാഹിത്യം കാലഘട്ടത്തിലൂടെ - ഡി.സി.ബുക്സ് കോട്ടയം		
Web. URLs	http://www.keralaculture.org>literature http://www.manoramaonline.com		

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Group project	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	H	H	H							
CO2	-	-	H	M	H	M							
CO3	-	-	M	M	M	H							
CO4	-	-	L	H	L	H							
CO5	-	-	L	M	L	H							

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. N. Rajini	Dr. Smitha. C. R

Course Code	Title		
23U1FRN202	Part – I : Le Français Fondamental – II		
Semester : II	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	This course is comprised of deep study of grammar categories and aims to apply the grammatical structures correctly.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	This course aims to develop communicative competence of the students in French, to create cultural awareness, to promote autonomy in learning French.		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Acquire an understanding of French culture, use the basic foundation of verbs.	Lecture	Assignment
CO 2	Describe a place, learn pronom en, y and adjectives.	Tutorial / Case Studies	Seminar
CO 3	Recall the tenses and learn Imparfait tense	Lectures / Video Lessons	Quiz
CO 4	Write about the weather and learn pronom COD,	Word game / Lecture	Assignment
CO 5	Write short passages and translate, Comprehend the passage and learn pronom COI	Lecture	Group project

Offered by	Department of French

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	Goûter à la campagne	1	5
	Instructional Hours		**12**
Suggested Learning Methods: Worksheets, TV5 App			
II	Voyager dans sa ville	1	6
	Instructional Hours		**12**
Suggested Learning Methods: Kahoot App, Duolingo			
III	Faire du neuf avec du vieux	1	7
	Instructional Hours		**12**
Suggested Learning Methods : Comprehensive Writing			

IV	Changer d'air	1	8
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive Writing			
V	Devenir éco-citoyen	1	9
		Instructional Hours	**12**
Suggested Learning Methods : Translating simple sentences and short passages			
		Total Hours	**60**

Text Books	Saison 1 Méthode de Français – Marie-Noëlle Cocton, Anouchka De Oliveira, Dorothée Dupleix (Unit 5 to 9)
Reference Books	A1 Echo Méthode de Français
Web. URLs	Lingua.com, TV 5 app, Learn French by podcast (spotify)

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-	-	-	-	-	-
CO2	-	-	H	L	H	M	-	-	-	-	-	-	-
CO3	-	-	-	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	M	L	H	-	-	-	-	-	-	-
CO5	-	-	L	-	H	-	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Malathi	Dr. S. Malathi

Course Code	Title		
23U2ENG202	Part – II : Professional English – II		
Semester : II	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	To equip the students with the language skills and its functional usage. Facilitate the insight and taste of Literature.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	SD: Helps to develop LSRW skill		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Mastering life skills through prose discourse.	Lecture/Tutorial	Assignment
CO 2	Acquire ethics and values through poetic genre.	Lecture/Tutorial	Assignment
CO 3	Recognise the nuances of English language through short stories.	Lecture/Tutorial	Speaking
CO 4	Enhance fluency over language with self-confidence.	Lecture/Tutorial	Reading
CO 5	Examine how the language is used in literature and develop LSRW Skills	Lecture/Tutorial	Writing

Offered by | **Department of English**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	**Prose** E.M. Forster - Tolerance Mahatma Gandhi - Women Not the Weaker Sex Issac Asimov - The Fun They had **Listening Activity** – Comprehension practice from Prose.	1	1-3
		Instructional Hours	**12**
Suggested Learning Methods : Cooperative Learning			
II	**Poetry** Robert Frost - Stopping by Woods on a Snowy Evening William Blake - A Poison Tree Alexander Pope – Ode on Solitude **Speaking Activity** – Group Discussion Forum	1	4-6
		Instructional Hours	**12**
Suggested Learning Methods : Inquiry Based Learning			
III	**Short Stories** Mark Twain - The Cat and the Painkiller Japanese Folk Tale - The Envious Neighbour Hector Hugh Munro (Saki) – The Open Window **Reading Activity** – Pronunciation practice and enhancement from Short-stories	1	7-9
		Instructional Hours	**12**
Suggested Learning Methods : Classroom Activity			

IV	**Grammar** Articles Concord Active and Passive Voices Direct and Indirect Speech **Writing Activity** – Paragraph Writing using grammar Components	1	10-13
		Instructional Hours	**12**
Suggested Learning Methods : Direct Method			
V	**Writing Skills** Resume Writing Email Writing Dialogue Writing Testimonial Writing Creative Writing	1	14-17
		Instructional Hours	**12**
Suggested Learning Methods : Activity Based Learning			
		Total Hours	**60**

Text Books	Compiled by the Department of English NASC.
Reference Books	CLIL (Content & Language Integrated Learning) – Module by TANSCHE NOTE: (Text: Prescribed chapters or pages will be given to the students by the department and the college)
Web. URLs	

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Speaking	Reading	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	H	L	M	M	H	M	H	H	M	H	M
CO2	M	L	H	L	H	M	H	M	H	H	M	H	M
CO3	M	L	H	L	H	H	H	H	H	H	M	H	M
CO4	M	L	H	L	H	L	H	H	H	H	M	H	H
CO5	H	M	H	L	H	H	H	H	H	H	H	H	M

H-High; M-Medium; L-Low

Course designed by	Verified byChairman
Dr. D. Pradeek	Dr. R. Malathi

Course Code	Title		
23U3MBC203	Core Paper III – Microbial Diversity		
Semester: II	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	The objective of this course is to make students understand the diversity of microbial world and systematic classification systems. The course will provide insights into study of microbes and distinguishing features associated with them based on morphological, chemical, structural and metabolic characteristics
Course Category	Skill Development
Development Needs	Global
Course Description	This course will study the diversity of Bacteria and Archaea in selected ecosystems at an organismal level, investigate the metabolic and enzymatic diversity in microbes that contribute to and thrive within these environments.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Learn criteria used for bacterial classification.	Lecture	Assignment
CO 2	Describe classification of eubacteria and actinomycetes.	Flipped Classroom	Seminar
CO 3	Understand the characters and significance of eubacteria and actinomycetes.	Video Lessons	Quiz
CO 4	Know the characters and significance of fungi.	Tutorial	Seminar
CO 5	Explain characters and significance of algae.	Lecture / Case Studies	Seminar

Offered by	Microbiology

Course Content	Instructional Hours / Week: 5

Unit	Description	Text Book	Chapters
I	**Taxonomy:** Principles – Modern approaches - Numerical-Genetic, Serotaxonomy and Chemotaxonomy. Whittaker's five kingdom concept. Haeckel's three kingdom concept	1	19
	Instructional Hours		**15**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Taxonomy of Eubacteria and Actinomycetes:** Detailed classification upto genus level with general characters of each group – Bergey's Manual and its importance.	1	20
	Instructional Hours		**15**
Suggested Learning Methods: Chart Preparation			
III	Eubacteria and Archaebacteria: Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.	1	20
	Instructional Hours		**15**
Suggested Learning Methods: Videos			
IV	**Taxonomy of Fungi** (Alexopolous): General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.	2	4

		Instructional Hours	**15**
Suggested Learning Methods: You tube videos			
V	**Taxanomy of Algae and Protozoa**: General Characters and its importance – Cholorophyta- Euglenophyta – Chrysophyta - Phaeophyta - Rhodophyta – Pyrrophyta-Taxonomy of Protozoa – General characters and its importance – Mastigophora, Rhizopoda, Ciliata, Sporozoa.	3	2
		Instructional Hours	15
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**75**

Text Books	1. Joanne M.Willey, Linda M. Sherwood, Christopher J. Woolverton, **Prescott, Harley, andKlein's Microbiology**, 7th Edition, McGraw Hill Edition, 2008. 2. Sullia S.B., Shantharam S., **General Microbiology**, 2nd Edition (Revised), Oxford University Press.2019. 3. Ashok Kumar Aswasthi, Text Book of Algae, Vikas Publishing house, 2015.
Reference Books	1. Stainer R.Y. Ingraham J.L. Wheolis H.H and Painter P.R. **The Microbial World**,5thedition. Eagle Works Cliffs N.J. Prentica Hall, 1986. 2. Gerard J. Tortora, Berdell R. Funke, Christine L. Case, Derek Weber, Warner Bair, 3. **Microbiology: An Introduction**, 4th edition, Pearson Education, 2019. 4. Willey, J.M., Sherwood, L and Wool Verton C.J. **Prescott's Microbiology**. 8thedition,McGraw Hill, New York, 2011.
Web. URLs	https://www.edx.org/course/the-extremes-of-life-microbes-and-their-diversity

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	M	H	M	L	M	L	M	H	H	H	H	L	H
CO2	M	H	M	H	M	L	M	H	H	H	H	H	H
CO3	H	H	M	H	M	L	M	H	H	H	H	L	H
CO4	M	L	L	L	H	L	M	H	H	H	H	H	H
CO5	M	L	L	L	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. K. E. Vivekanandan	Dr. M. Thangavel

Course Code	Title		
23U3MBC204	Core Paper IV – Microbial Genetics		
Semester: II	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To make the students to understand on Historical introduction to Genetics and genetic materials, understanding the concept and principles of genetics exchanges and its expression in host and to provide an idea about gene regulations and its control
Course Category	Skill Development
Development Needs	Global
Course Description	Genetics of bacteria and phage, focusing on replication, repair, transcription, translation, gene regulation, genetic networks, plasmids, conjugation, transformation, microbial and phage interactions and Mutations.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Acquire knowledge on historical overview of microbial genetics and genetic materials	Lecture	Assignment
CO 2	Understand the concept of replication of genetic materials	Flipped Classroom	Seminar
CO 3	Understand about regulation of gene expression and mutation	Video Lessons	Quiz
CO 4	Demonstrate the genetic exchange mechanism in microorganisms	Tutorial	Seminar
CO 5	Gain knowledge on Oncogenes	Lecture / Case Studies	Seminar

Offered by | **Microbiology**

Course Content	Instructional Hours / Week: 5

Unit	Description	Text Book	Chapters
I	Genetics – Historical introduction – Mendelian Principles DNA as genetic material: Griffith, Avery, MacLeod and McCarthy experiment. RNA as a genetic material: Fraenkel, Conrat & Singer experiment, Hershy and Chase. Structure DNA and RNA - Types of RNA.	3	7
	Instructional Hours		**15**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	Replication of DNA: Replication in Prokaryotes and Eukaryotes - Mechanism and Enzymology. Methods of DNA replication: Semi conservative, conservative, dispersive. Plasmid: Structure, Properties and types - Rolling circle mechanism, θ mode of replication.	2	9
	Instructional Hours		15
Suggested Learning Methods: Chart Preparation			
III	Bacterial Genetics: Concepts of haploid genomes Genetic exchange: Transformation, Transduction and Conjugation Transposons.	1, 4	14,16
	Instructional Hours		15
Suggested Learning Methods: Videos			
IV	Organization of genes and Chromosomes: Gene expression in Prokaryotes and Eukaryotes. Transcription and Translation in	4	12

	Prokaryotes and Eukaryotes. Genetic code - Operon concept: lac & trp Operon		
		Instructional Hours	15
Suggested Learning Methods: You tube videos			
V	Mutation: Spontaneous and Induced Mutation, DNA repair mechanism, Oncogenes: Proto-oncogenes and viral oncogenes	4	12
		Instructional Hours	15
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**75**

Text Books	1. Daniel, L. Hartl., W. Elizabeth and Jones. (2001). Genetics-Analysis of Genes and Genomes, Jones and Bartlett publishers, UK. 2. David Frifelder. (1990). Microbial Genetics, Narosa publishing house, New Delhi. 3. Gardner, E.J., Simmons, M.J., and Snustad, D.P. (2006). Principles of Genetics. John Wiley & sons. 4. Old, R.S. and Primrose, S.B. (1989). Principles of Gene Manipulation, Blackwell Scientific Publications, London.
Reference Books	1. Larry Synder and Wendy Champness. (2003). Molecular Genetics of Bacteria. American Society for Microbiology, Washington. 2. Lodish, H., Baltimore, D. Berk, A. Zipsury, S.L., Matsudaira, P. Darnell, J. (1995). Molecular Cell Biology. Scientific American Books. 3. Malor, Sr, Cronan Jr. JE. Freifelds D. (2003). Microbial Genetics. Jones and Bartlett Publishers
Web. URLs	https://www.edx.org/course/the-extremes-of-life-microbes-and-their-diversity

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	M	H	M	L	M	L	M	H	H	H	H	L	H
CO2	M	H	M	H	M	L	M	H	H	H	H	H	H
CO3	H	H	M	H	M	L	M	H	H	H	H	L	H
CO4	M	L	L	L	H	L	M	H	H	H	H	H	H
CO5	M	L	L	L	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Kasimani	Dr. M. Thangavel

Course Code	Title		
23U3MBP205	Core Paper – V Lab in Fundamentals of Microbiology, Cell Biology and Genetics		
Semester: I & II	Credits: 4	CIA: 40 Marks	ESE: 60 Marks

Course Objective	To gain knowledge on the laboratory skills, control of infectious sources
Course Category	Skill Development / Employability / Entrepreneurship
Development Needs	Global, Local and Regional needs
Course Description	This is a skill-oriented course that will help the student to acqui8re the practical skills that will enable them to get employment in hospitals or to start their own laboratories and become an entrepreneur

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Develop knowledge on laboratory guidelines and on various instruments and sterilization methods	Practical	Demonstration
CO 2	Understand different types staining of microorganisms	Practical	Demonstration
CO 3	Understand media preparation, culture techniques and preservation of microbes	Practical	Demonstration
CO 4	To study on the cell biology and cell division	Practical	Demonstration
CO 5	To acquire knowledge on the microbial genetics	Practical	Demonstration

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 5 and 5

Exp. No	FUNDAMENTALS OF MICROBIOLOGY-INSTRUMENTATION
1	Laboratory Precautions, Basic lab glass wares, Microscopic techniques – Bright field and Dark field Basic Lab Instruments : Autoclave, Hot Air Oven, pH meter, Centrifuge, Laminar Air flow Methods of Sterilization – Dry heat-Hot Air oven, Moist Heat- Autoclave, Chemical Methods- Alcohols and Aldehydes
	STAINING
2	Bacterial Staining – Simple, Grams, Acid Fast, Spore and Capsule Fungal Staining-KoH Mount and Lacto phenol cotton blue
	MEDIA PREPARATION
3	Culture media preparation – Liquid and Solid media, Types of media- Simple, Defined, Complex, Enriched, Enrichment, Differential, Selective Transport and Anaerobic media Pure culture techniques – Pour plate, Spread plate and Streak plate Cultural characteristics of microorganisms, Cultivation of anaerobic bacteria – Wrights tube and Anaerobic jar method
	CELL BIOLOGY
4	Cell motility- Cilia, Flagella of Prokaryotes Cellular basis of differentiation and development – Mitosis Different types of cells –Parenchyma, Collenchyma, Epithelial cells. Mitosis and Meiosis

GENETICS	
5	Preparation of Competent Cells, Gene Transfer by Conjugation, Ames Test
Text Books	**1.**James G. Cappucino – Microbiology – a Laboratory manual 2.Rajan and Selvi Christy - Experimental Procedures in Life
Reference Books	1.Dubey and Maheswari – Practical Microbiology
Web. URLs	**https://microbnotes.com**

Tools for Assessment (40 Marks)

Laboratory Performance			**Test - I**	**Test - II**	**Observation notebook**	**Total**
Level of engagement in lab	**Preparation**	**Result**				
5	**5**	**5**	**10**	**10**	**5**	**40**

Mapping

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	H	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H	H	H	H
CO5	L	L	L	L	L	L	L	L	L	L	L	L	L

H-High; M-Medium; L-Low

Course designed by	**Verified by Chairman**
Dr. M. Thangavel	Dr. M. Thangavel

Course Code	Title		
23U3BYR202	Allied Paper II – Lab in Biochemistry		
Semester: II	Credits: 2	CIA: 30 Marks	ESE: 45 Marks

Course Objective	The lab aims to develop the skills in biochemical analysis and to develop the skills of the students in Qualitative and Quantitative Analysis of biomolecules. The student is able to quantify the biochemical molecules. The students equip themselves with the basic biochemical tools and standard operation procedures
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	This course provides familiarization with protein and enzyme techniques in the laboratory, and properties of amino acids and sugars. There is some material dealing with DNA and very basic molecular biology

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Determine the absorption Maxima of different molecules and verify Beer's law.	Lecture / Hands on	Behaviour
CO 2	Identify carbohydrates and amino acids present in the given unknown sample.	Lecture / Hands on	Observation
CO 3	Asses DNA and Proteins in the specified sample.	Lecture / Hands on	Performance
CO 4	Familiarize paper and thin layer chromatography techniques.	Lecture / Hands on	Performance
CO 5	Separate macromolecules using column chromatography.	Lecture / Hands on	Observation

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 4

Exp No	Experiments
1.	Determination of absorption maxima (λ max) of small molecules and macromolecules
2.	Verification of Beer's Law
3.	Calculation, preparation of normal, molar and percentage solutions
4.	Determination of Acid number
5.	Determination of Iodine number
6.	Determination of molar extinction coefficient.
7.	Qualitative analysis of carbohydrates
8.	Qualitative analysis of amino acids
9.	Colorimetric estimation DNA by diphenylamine method
10.	Colorimetric estimation of proteins by Biuret/Lowry method
11.	Paper chromatographic separation of amino acids
12.	Thin layer chromatographic separation of amino acids
13.	Column Chromatography
	Total Hours **60**

Text Books	SadasivamS., Manickam A. **Biochemical Methods**, New Age International Pvt. Ltd.,2018. Jayaraman J. **Laboratory Manual in Biochemistry**, New Age International Pvt. Ltd.,2011
Reference Books	David Plummer. **An Introduction to Practical Biochemistry**, 3rd edition, McGrawHill Education, 2017. Sharma DC., Manminder Riyat, **Practical Medical Biochemistry**, Wolters KluwerIndia Pvt. Ltd. 2018
Web. URLs	https://www.classcentral.com/course/swayam-experimental-biochemistry-12909

Tools for Assessment (30 Marks)

Laboratory Performance			Test - I	Test - II	Observation Note Book	Total
Level of engagement in lab	Preparation	Result				
4	4	4	7	7	4	30

Mapping

CO \ PO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO3	PSO4	PSO 5
CO1	M	H	L	L	L	L	L	H	L	L	M	L	L
CO2	H	M	L	L	M	M	L	M	L	M	L	L	L
CO3	H	H	L	H	L	M	L	H	H	H	L	L	M
CO4	M	L	L	L	L	L	L	M	L	M	L	L	L
CO5	H	H	M	L	M	M	M	H	L	L	L	L	L

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Dinesh M. D	Dr. M. Thangavel

Course Code	Title	
21U4HRC202	Ability Enhancement Compulsory Course - Human Rights and Constitution of India	
Semester : II	Credits : 2	CIA : 50 Marks

(Common to all UG Programmes)

Course Objective:

Understand the concept of human rights and the importance of Indian Constitution.

Course Outcomes:

CO1	Understand the principal aspects of human rights and duties in a broad sweep.
CO2	Acquire the knowledge about the Fundamental Duties and Rights of Indian Citizen
CO3	To know the rights of women and Children in India
CO4	Understand the structure and importance of Indian Constitution
CO5	Know the functions of Government and Election Commission of India

Course Content **Instructional Hours / Week : 2**

Unit	Description	
I	An Introduction to Human Rights :Values – Dignity, Liberty, Equality, Justice, Unity in Diversity - Human Rights – Meaning and features; Significance of the study - Classification of Human Rights - Rights and Duties – Correlation	
	Instructional Hours	**6**
II	Human Rights and Fundamental Rights - Fundamental Rights and Fundamental Duties- Directive Principles - Role of Judiciary in the protection of Human Rights- National Human Rights Commission *Activity : Case Study related to Human Rights*	
	Instructional Hours	**6**
III	Human Rights of Women and Children- Social Practice and Constitutional Safeguards – Female foeticide and infanticide-Physical assault and Harassment- Domestic violence- Conditions of Working Women *Activity : Conduct a Group Discussion on the above topics*	
	Instructional Hours	**6**
IV	**Constitution – Structure and Principles** - Meaning and importance of Constitution - Making of Indian Constitution –Sources - Salient features of Indian Constitution- Government of Union- Government of State-Features of judicial system in India	
	Instructional Hours	**6**
V	Federalism in India – Features - Local Government -Panchayat –Powers and functions -Election Commission –Organisation and functions-Citizen oriented measures – RTI – Provisions and significance *Activity : Seminar/ Role play related to Indian Constitution*	
	Instructional Hours	**6**
	Total Hours	**30**

Text Book:

1. **"Human Rights and Constitution of India",** Complied by Curriculum Development Cell, Nehru Arts and Science College.

Tools for Assessment (50 Marks)

Case Study and Report submission	Seminar / Role play	Group Discussion	Comprehensive test for 5×5 = 25 marks	Total
10	10	5	25	50

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	L	H	H	H	H					
CO2	-	-	-	L	H	H	H	H					
CO3	-	-	-	L	H	H	H	H					
CO4	-	-	-	L	H	H	H	H					
CO5	-	-	-	L	H	H	H	H					

H-High; M-Medium; L-Low

Course Designed by	Verified by	Checked by	Approved by Chairman
Dr. E. Vijaya Gowri	Dr. E. Vijaya Gowri	Dr. N. Saranya	Dr. N. Saranya

Course Code	Title	
22U4HVY201	Value Education : Human Values and Yoga Practice	
Semesters : I & II	Credits : 2	CIA : 50 Marks

(Common to all UG Programmes)

Course Objective:

- To help the students appreciate the essential complementarity between 'values' and 'skills' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To prepare and distribute standardized Yoga teaching and training material with reference to institute health**.**

Course Outcomes:

CO1	To know the importance of Ethics to be followed in the Human life.
CO2	To inculcate a sense of respect towards harnessing values of life and spiritof fulfilling social responsibilities.
CO3	To gain knowledge about the values that develops life skills.
CO4	To understand and Practice Meditation & Surya Namaskar.
CO5	To understand and apply the knowledge for physical health and well being through Asanas

Course Content **Instructional Hours / Week : 1 (For Semesters I and II)**

Unit	Description
I	**Human Values –** Introduction - Definition of Ethics and Values - Character and Conduct - Nature and Scope of Ethics. **Individual and Society** - Theories of Society - Social Relationships and Society - Empathy: Compassion towards other beings.
	Instructional Hours 4
II	**Self-realization and Human Values**-Self-realization and Harmony-Rules and Regulations-Rights and Duties-Good and Obligation-Integrity and Conscience. **Obligation to Family**-Trust and Respect-Codes of Conduct.
	Instructional Hours 5
III	**Character Formation Towards Positive Personality**: Truthfulness, Constructivity, Sacrifice, Sincerity, Self Control, Altruism, Tolerance, Scientific Vision. **Refinement of worries**: Neutralization of anger-Intelligent quotient(IQ),Emotional quotient(EQ),Spiritual Quotient (SQ)
	Instructional Hours 5
IV	**Power of Meditation**- Development of mind in stages - Mental Frequencies Methods for Concentration. Meditation Practices - Surya Namaskar. Physical Exercises -Kayakalpa Practices Training for Potentialising the Mind.
	Instructional Hours 6

V	**ASANAS** **Standing Posture:** Tadasana, Utkattasana, arthaKadi Chakrasana, Trikonasana, Artha Chandrarasana, Padahastasana, Virabhadrasana, Vrikshasana, Artha, Natarajasana. **Sitting posture:** Padmasana, Gomukasana, Ustrasana, ArdhaMatsyendrasana, Patchimottanasana. **Prone posture:**Bhujangasana, shalabhasana, Dhanurasana, Chakrasana. **Supine posture:**Sarvangasana, Halasana, Matsyasana, Shanti asana **Pranayama:** Bhastrika, Bhramari, NadiShodhan	
	Instructional Hours	**10**
	Total Hours	**30**

Text book:

1. **"Value Education",** compiled by Curriculum Development cell, Nehru Arts and Science College.

Tools for Assessment

25 marks	25 marks
Comprehensive test in Units I to III for 25 marks during CIA III of Sem. II	Perform 02 Yoga postures for Practical exam to be conducted during the mid. of Sem. II

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	H	L	M	H	H					
CO2	-	-	-	L	M	H	M	H					
CO3	-	-	-	L	M	H	S	H					
CO4	-	-	-	L	L	H	M	H					
CO5	-	-	-	L	L	H	M	H					

H-High; M-Medium; L-Low

Course Designed by	Verified by HOD	Checked by	Approved by Chairman
Dr. Karthi. M	Dr. N. Kavitha		

SEMESTER – III

Course Code	Title		
23U1TAM303	Part -I : Arunthamizh (அருந்தமிழ்)		
Semester: III	Credits: 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective	தமிழ்க் காப்பியங்களின் வழி அறம் சார்ந்த சிந்தனைகளை உருவாக்குதல்
Course Category	**Skill Development (**மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)
Development Needs	**Global/Regional (**உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்**)**
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல் மற்றும் உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	தமிழ் நூல்களில் அணிநலம் அறிதல், அறம் சார்ந்த சிந்தனைகளை வளர்த்தல்.	விரிவுரை/ காணொளிப்பட விளக்கம்	ஒப்படைவு
CO 2	தமிழ் இலக்கிய வகைகளைக் கூறுவதன் மூலம் தமிழின் இலக்கிய வளத்தை உணரச்செய்தல்.	விரிவுரை	குழுத்திட்டம்
CO 3	மாணவர்களிடையே காலத்திற்கேற்ப மொழிவளர்ச்சியை உருவாக்குதல்.	விரிவுரை/ காணொளிப்பட விளக்கம்	ஒப்படைவு
CO 4	நாட்டின் சிறந்த குடிமக்களாக மாணவர்களை உருவாக்குதல்.	விரிவுரை// குழு விவாதம்	கருத்தரங்கு
CO 5	மாணவர்களின் மனநலத்தை வளர்த்தல்.	விரிவுரை/ குழு விவாதம்	கருத்தரங்கு

Offered by தமிழ்த்துறை

Course Content : Arunthamizh (அருந்தமிழ்) — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	காப்பியங்கள்	1.சிலப்பதிகாரம் 2.மணிமேகலை 3.சீவகசிந்தாமணி 4.கம்பராமாயணம்	1.1அடைக்கலக்காதை (மதுரைக்காண்டம்-பகுதி- 15) 1.2.பீடிகைக் கண்டுபிறப்புணர்ந்தக் காதை-பகுதி-9) 1.3.பூமகள் இலம்பகம் (பகுதி- 11-2347-2377 பாடல்கள்) 1.4சுந்தரகாண்டம்(கடல் தாவுப்படலம் 1-10பாடல்கள்)
		Instructional Hours	**12 Hours**
Suggested Learning Methods: நாடக முறையில் கலந்துரையாடல்			
II	சைவ,வைணவ, சுவடியியல்	1. தேவாரம் 2..நாலாயிரத்திவ்வியப் பிரபந்தம் 3.சுவடியியல்	2.1.திருநல்லூர்ப் பெருமணம் (பாடல் எண்-4137-4146) 2.2.ஆண்டாள் திருப்பாவை - (பாடல் எண்- 474-483) 2.3.சுவடியியல் - அறிமுகம் 2.4 சைவம் தமிழுக்குச் செய்த தொண்டு 2.5 வைணவம் தமிழுக்குச் செய்த தொண்டு
		Instructional Hours	**12 Hours**
Suggested Learning Methods : பக்தி பாசுரங்கள் கலந்துரையாடல்			

III	மொழித்திறன் (இலக்கணம்)	1.நன்னூல் 2.தொல்காப்பியம்	3.1 நூல் வரலாறு (முதல் நூல், வழி நூல், சார்பு நூல்) 3.2 மாணாக்கர் வரலாறு 3.3 ஆசிரியர் வரலாறு 3.4 எண்வகை மெய்ப்பாடுகள்
Instructional Hours			**12 Hours**
Suggested Learning Methods :	மொழித்திறன் வாயிலாக பிழையின்றி எழுதும் திறன் பெற்றமை		
IV	நாட்டுப்புற வழக்காறுகள்	நாட்டுப்புறவியல்	4.1. பழமொழிகள் 4.2. விடுகதைகள் 4.3 தமிழர்க்கலைகள் 4.4 சிறுதெய்வ வழிபாடு மட்டும் 4.5 விளையாட்டுகள் (சிறுவர்,சிறுமியர் மட்டும்)
Instructional Hours			**12 Hours**
Suggested Learning Methods :	நாட்டுப்புறவியல் வழி நாட்டுப்புற மக்களின் வாழ்வியலை அறியச்செய்தல்		
V	இலக்கிய வரலாற்றுத் திறன்	தமிழ் இலக்கிய வரலாறு	1. காப்பியத்தின் தோற்றமும் வளர்ச்சியும் 2. பக்தி இலக்கியத்தின் தோற்றமும் வளர்ச்சியும் 3. தமிழக நாட்டுப்புறவியல் வரலாறு
Instructional Hours			**12 Hours**
Suggested Learning Methods:	பாடத்திட்டத்தில் கொடுக்கப்பட்டுள்ள இலக்கிய வரலாற்றினை உணர்த்துதல்		
Total Hours			**60 Hours**
Text Books	இளங்கலை இரண்டாம் ஆண்டு தமிழ் மாணவர்களுக்குரிய பாடநூல் **"அருந்தமிம்"** தொகுப்பு: தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.		
Reference Books	நாட்டுப்புறவியல் ஓர் ஆய்வு: டாக்டர் சு. சக்திவேல் விஜயா பதிப்பகம் சென்னை. தமிழண்ணல் - புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சிப் புத்தக நிலையம், மதுரை- 625 001.		
Web. URLs	https://youtu.be/EJcYgyw7e94, https://youtu.be/MgtwmerI4yw		

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
4	4	5	2	2	3	20

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	H	L	L	H	M	L					
CO2	M	L	H	L	H	L	M	H					
CO3	H	L	L	L	H	M	H	M					
CO4	M	L	H	L	M	M	H	L					
CO5	H	L	M	L	H	L	M	H					

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. S. Satheesh Kumar	Dr. A. Sridevi

Course Code	Title		
23U1HIN303	Part -- I : Sahityak Hindi		
Semester : III	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	चुनिंदा कविताओं के माध्यम से हिंदी कविता की उत्पत्ति और विकास को समझना।. संकलन में उपलब्ध कराए गए सर्वोत्तम नमूनों का उपयोग करते हुए कविता की सराहना।		
Course Category	Skill Development		
Development Needs	Global		
Course Description	Improved accuracy & quality, improved communication		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	छात्र हिंदी भाषा से अच्छी तरह वाकिफ हो सकेंगे।	Smart boards and Role play	Assignment
CO 2	व्यक्तिगत अनुभवों की पहचान करें जिनका उपयोग कविताएँ लिखते समय किया जा सकता है।	Group learning Acting and Story Narration	Seminar
CO 3	कविता की मूल शब्दावली और व्यावहारिक तत्वों को समझें।	Smart boards and YouTube Videos	Assignment
CO 4	छात्रों को रचनात्मक लेखन में अच्छा अभ्यास मिलेगा।	Group learning and Work sheets	Group Project
CO 5	पाठ्यक्रम संवादी हिंदी में पारंगत होने में मदद करता है।	Worksheets and Exercises	Seminar

Offered by Hindi

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	नाटक - सत्यमेव जयते - (श्री सूर्यनारायण मूर्ति)	1	3
		Instructional Hours	**12**
Suggested Learning Methods : Visual Learning			
II	प्राचीन काव्य : कबीर के दोहे (10 दोहा), सूरदास के पद (4 पद) (काव्य तरंग)	1	2
		Instructional Hours	**12**
Suggested Learning Methods : Auditory			
III	1) आधुनिक काव्य : पुष्प की अभिलाषा - माखनलाल चतुर्वेदी , जलियांवाला बाग़ में बसंत - सुभद्राकुमारी चौहान, शक्ति और क्षमा - रामधारी सिंह दिनकर 2) संक्षिप्तीकरण	1	3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive Writing			

IV	अलंकार : 1) अर्थ अलंकार और शब्द अलंकार, 2) दिए गए चित्र पर कुछ वाक्य लिखना ।	1	2
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual, Comprehensive			
V	गद्यांश लेखन, वाक्य शुद्धि, शब्द शुद्धि, अनेक शब्द के लिए एक शब्द	1	4
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Text Books	1. नाटक - सत्यमेव जयते - (श्री सूर्यनारायण मूर्ति) 2. काव्य सुमन - राजपाल एंड सन्स
Reference Books	1. हिंदी नाटक और रंगमंच - डॉ राम कुमार वर्मा 2. ओंकार नाथ वर्मा , सामान्य हिंदी अरिहंत प्रकाशन इंडिया लिमिटेड
Web. URLs	1. www.webdunia.com 2. https://www.hindikunj.com 3. www.bhashaindia 4. Www.hindisamay.com

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	M	L							
CO2	-	-	H	L	L	H							
CO3	-	-	-	L	M	H							
CO4	-	-	M	M	H	L							
CO5	-	-	L	M	H	L							

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Swarnalatha	Dr. S. Swarnalatha

Course Code	Title		
23U1MAL303	Part – I : Kavithayum Smaranayum		
Semester : III	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	കവിതാ സാഹിത്യ പരിചയത്തോടൊപ്പം പുതു കവിതകളെ കുറിച്ച് അവബോധവും ആസ്വാദനവും ഉയർത്തുക. വിദ്യാർത്ഥികൾക്ക് മാതൃകയാവുന്ന സമൂഹത്തിലെ ഉന്നത വ്യക്തിത്വങ്ങളെ പരിചയപ്പെടുത്തുക		
Course Category	Skill Development		
Development Needs	Global		
Course Description	Creating Imagination and Self confidence		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	കവിതയിലൂടെയുള്ള സംവേദനം	Lecture / Video Methods	Assignment
CO 2	പ്രകൃതിയുടെ നിസ്വാർത്ഥമായ പ്രവർത്തനങ്ങൾ	Group Learning	Seminar
CO 3	അധ്യാപക വിഭാഗത്തിനിടയിൽ അവകാശ ബോധം ഉണ്ടാക്കുന്നു	Peer Teaching	Assignment
CO 4	സമൂഹത്തിന് മൂല്യബോധമുണ്ടാക്കുന്ന പ്രവർത്തനങ്ങൾ	Group learning	Group Project
CO 5	സമൂഹത്തിൽ അധ്യാപനത്തിന്റെ പ്രാധാന്യം	Worksheets / Dumb Charades	Assignment

Offered by	Department of Malayalam
Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	നവീന കവിത - പുതു കവിതകൾ	1	4
		Instructional Hours	12
Suggested Learning Methods : Visual Learning			
II	നവീന കവിത - പുതു കവിതകൾ	1	3
		Instructional Hours	12
Suggested Learning Methods : Auditory			
III	കണ്ണീരും കിനാവും - വി.ടി.ഭട്ടതിരിപ്പാട്	1	3
		Instructional Hours	12
Suggested Learning Methods : Comprehensive writing			

IV	കണ്ടൽകാടുകൾക്കിടയിൽ - കല്ലേൻപൊക്കുടൻ	1	2
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual			
V	കണ്ടൽകാടുകൾക്കിടയിൽ - കല്ലേൻപൊക്കുടൻ	1	3
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Text Books	1. നവീന കവിത (പുതു കവിതകൾ) - നെഹ്റു കോളെജ് മലയാള വിഭാഗം എഡിറ്റു ചെയ്ത 10 കവിതകൾ . 2. കണ്ണീരും കിനാവും - വി.ടി.ഭട്ടതിരിപ്പാട് -ഡി.സി. ബുക്ക്സ് 3. കണ്ടൽകാടുകൾക്കിടയിൽ - കല്ലേൻ പൊക്കുടൻ - ഗ്രീൻ ബുക്ക്സ്
Reference Books	1. മലയാള കവിതാപഠനങ്ങൾ - സച്ചിദാനന്ദൻ ,മാതൃഭൂമി ബുക്സ്, കോഴിക്കോട് 2. കവിതാ സാഹിത്യ ചരിത്രം - ഡോ.എം.ലീലാവതി കേരള സാഹിത്യ അക്കാദമി, തൃശൂർ 3. ആധുനികത മലയാള കവിതയിൽ എൻ. അജയകുമാർ, പഠന സംഘം, ചങ്ങനാശ്ശേരി 4. സാഹിത്യം മലയാളത്തിൽ ആത്മകഥ - നടുവട്ടം ഗോപാലകൃഷ്ണൻ , ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട് , തിരുവനന്തപുരം
Web. URLs :	1. http://www.keralaculture.org>literature

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-	-	-	-	-	-
CO2	-	-	H	L	H	M	-	-	-	-	-	-	-
CO3	-	-	-	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	M	L	H	-	-	-	-	-	-	-
CO5	-	-	L	-	H	-	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. N. Rajini	Dr. Smitha C R

Course Code	Title		
23U1FRN303	Part – I : Le Francais General – III		
Semester : III	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	Acquisition of standard French by knowing more about the culture.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	Improved understanding and communication		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Learn about the other French speaking nations, hobbies,	Lectures/ Tutorial	Assignment
CO 2	Le passé compose, l'imparfait	Group Learning	Assignment
CO 3	Social network, les indicateurs de temps	Peer Teaching	Seminar
CO 4	Le discours direct et indirect	Video Lecture / Lectures	Group Project
CO 5	To learn to answer questions orally in French	Group learning	Assignment

Offered by Department of French

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	La langue francaise en action	1	1
		Instructional Hours	12
Suggested Learning Methods : Visuals			
II	Aller a la rencontre des autres	1	2
		Instructional Hours	12
Suggested Learning Methods : Group discussions			
III	Enrichir son reseau	1	3
		Instructional Hours	12
Suggested Learning Methods : Group discussions			
IV	Vivre l'information	1	4
		Instructional Hours	12
Suggested Learning Methods : Visuals			
V	Interroger le passe	1	5
		Instructional Hours	12
Suggested Learning Methods : Comprehensive writing			
		Total Hours	60

Text Books	1. Saison 2 Méthode de Français – Marie-Noëlle Cocton, Anouchka De Oliveira, Dorothée Dupleix (Unit 0 to 4)
Reference Books	1. Connexions 2 Methode de Français Régine Mérieux , Yves Loiseau
Web. URLs	1. www.academia.edu

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-	-	-	-	-	-
CO2	-	-	H	L	H	M	-	-	-	-	-	-	-
CO3	-	-	-	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	M	L	H	-	-	-	-	-	-	-
CO5	-	-	L	-	H	-	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Malathi	Dr. R. Malathi

Course Code	Title		
23U2ENG303	Part – II : Communicative English – I		
Semester : III	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to All UG Programmes)			
Course Objective	To enable the students to learn the different genres of literature and gain a better understanding of the English language.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	SD: Helps to develop LSRW skill		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Execute moral, ethical and literary merits and relate it to the society.	Lecture/Tutorial	Assignment
CO 2	Exhibit a comprehensive knowledge of poetry and execute life skills and human values through it.	Lecture/Tutorial	Assignment
CO 3	Develop reading strategies with enriched vocabulary, through short story.	Lecture/Tutorial	Speaking
CO 4	Identify the use of English language through the study of Grammar and use them in specific contexts.	Lecture/Tutorial	Reading
CO 5	Interpret their understanding of English works in LSRW mode	Lecture/Tutorial	Writing

Offered by | **Department of English**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	**Prose** J.B. Priestley - Travel by Train R.K. Narayan - Headache E.M. Forster - Tolerance	1	1 - 3
		Instructional Hours	**12**
Suggested Learning Methods : Intensive Reading			
II	**Poetry** William Blake - The School Boy Rudyard Kipling - If Sarojini Naidu - The Queen's Rival	1	4 - 6
		Instructional Hours	**12**
Suggested Learning Methods : Scaffolding Method			
III	**Short Stories** O. Henry - After Twenty Years Edgar Allan Poe – Tell - Tale Heart Frank R.Stockton - The Lady or The Tiger?	1	7 - 9
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			

IV	Herman Melville-Moby Dick (Abridged Version)	1	10 - 13
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			
V	**Oral & Written Communication (UnitI–IV) Listening** – Comprehension practice from Poetry, Prose, Online Voice Practice, observing / viewing E-content (with subtitles), Guest / Invited Lectures, Conference/ Seminar Presentations & Tests, and DD National News Live, BBC, CNN, VOA etc **Speaking** – In Group Discussion Forum, participate in the Turn Taking, and Conversation Management, Debating, Defending / Mock Viva Voce, Seminar Presentations on Classroom-Assignments, and Peer-Team-interactions. **Reading**–Different Reading Strategies in Poetry, Prose, Novel, Newspaper etc **Writing** – Modals, Concord, E-Mail & Report Writing, Spotting the Errors and How to avoid them, Sentence Completion, Prepositions, Idioms and Phrases, Collocation.	1	14 - 17
		Instructional Hours	**12**
Suggested Learning Methods : Activity Based Learning			
		Total Hours	**60**

Text Books	Unit I–V: Compiled by the Department of English
Reference Books	CLIL (Content & Language Integrated Learning) – Module by TANSCHE NOTE:(Text: Prescribed chapters or pages will be given to the students by the department
Web. URLs	

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Speaking	Reading	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	H	-	M	M	H	M	H	H	M	H	M
CO2	M	-	H	-	H	M	H	M	H	H	M	H	M
CO3	M	-	H	-	H	H	H	H	H	H	M	H	M
CO4	M	L	H	-	H	-	H	H	H	H	M	H	H
CO5	H	M	H	-	H	H	H	H	H	H	H	H	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Adappatu Ancy Antony	Dr. R. Malathi

Course Code	Title		
23U3MBC306	Core Paper VI – Microbial Physiology and Metabolism		
Semester: III	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To provide the student with an overall vision of the operation of the different processes that allow growth of prokaryotic cells as well as their adaptation to a changing environment.
Course Category	Skill Development
Development Needs	Global
Course Description	Know the growth characteristics of the microorganisms, distinguish chemoheterotrophic metabolism, anaerobic respiration and fermentation. Understand the key concept of Microbial Physiology.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Know the growth characteristics of the microorganisms and understand the growth characteristics of the microorganisms which require different nutrient for growth.	Lecture	Assignment
CO 2	Recognize the associated mechanisms of energy generation for their survival.	Lecture	Assignment
CO 3	Distinguish the chemoheterotrophic metabolism-anaerobic respiration and fermentation.	Video Lessons	Quiz
CO 4	Improve knowledge on different metabolic pathways in microorganisms.	Tutorial	Seminar
CO 5	Understand the key concept of microbial physiology.	Lecture	Seminar

Offered by	Microbiology

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Microbial Growth and nutrient uptake:** Definitions of growth, Batch culture, Continuous culture, generation time and specific growth rate. Effect of oxygen concentration on growth. Nutritional categories of microorganisms. Passive and facilitated diffusion. Primary and secondary active transport, concept of uniport, symport and antiport Group translocation. Iron uptake.	1,2	1,3
	Instructional Hours		**12**
Suggested Learning Methods: **Video lectures**			
II	**Chemoheterotrophic Metabolism - Aerobic Respiration:** Concept of aerobic respiration, sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle. Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, electron transport phosphorylation, uncouplers and inhibitors.	2	8 & 9
	Instructional Hours		**12**
Suggested Learning Methods: Model and presentation			

III	**Chemoheterotrophic Metabolism - Anaerobic respiration and fermentation:** Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction). Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways.	1	8&9
		Instructional Hours	**12**
Suggested Learning Methods : Video lectures and demonstration			
IV	**Chemolithotrophic and Phototrophic Metabolism:** Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction). Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria and cyanobacteria.	1&2	10,12&14
		Instructional Hours	**12**
Suggested Learning Methods : Model presentation and group chart			
V	**Advances in microbial physiology**: Determination of bacterial growth curve, effect of temperature & pH on microbial growth, biochemical test - acid and gas production, starch hydrolysis, lipid hydrolysis.	3	7
		Instructional Hours	**12**
Suggested Learning Methods : Video lectures			
		Total Hours	**60**

Text Books	1. Kim B. H.. Gadd G.M., **Bacterial Physiology and Metabolism**. Cambridge University Press, Cambridge, 2008. 2. Albert G. Moat, John W. Foster, Michael P. Spector., **Microbial Physiology**, Wiley – Liss, Inc., New York, 4th Edition, 2003. 3. Alfred E. Brown, Heidi R. Smith, **Benson's Microbiological Applications: Laboratory Manual in General Microbiology**, McGraw-Hill Education, 14th Edition, 2017.
Reference Books	1. Robert K. Poole., **Advances in Microbial Physiology**, Elsevier Academic Press, New York, Volume 49, 2004. 2. Cohen, G. N., **Microbial Biochemistry**, Springer, New York, 3rd Edition, 2014. 3. Rose A.H., **Chemical Microbiology: An Introduction to Microbial Physiology**, Butterworth & Co., USA, 3rd Edition, 2014. 4. Daniel R. Caldwell, **Microbial Physiology & Metabolism**, Wm. C. Brown, Germany, 1995.
Web. URLs	https://sites.google.com/site/microbialphysiologyoddsem/Teaching-Contents

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	L	H	H	H	H	H	M	M	H

CO2	H	M	M	H	M	M	M	M	H	L	L	L	H
CO3	H	M	H	H	M	M	M	H	H	H	M	M	H
CO4	H	H	H	H	M	M	H	H	H	H	L	M	H
CO5	H	H	H	H	L	M	H	H	H	L	M	L	H
H-High; M-Medium; L-Low													

Course designed by	**Verified by Chairman**
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBC307	Core Paper VII – Environmental and Agricultural Microbiology		
Semester: III	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To provide the fundamental knowledge about the various scopes on Environmental and Agricultural Microbiology and their concepts.
Course Category	Employability
Development Needs	Global
Course Description	Learn about concepts of ecosystem, waste management and bioremediation of environment pollution.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand about the concepts of soil and aquatic ecosystem.	Lecture / Video lessons	Assignment
CO 2	Learn about the interaction of microorganisms and their role in environment.	Lecture / Flipped Classroom	Assignment
CO 3	Discuss about the microorganisms and pollution.	Lecture / Video Lessons	Quiz
CO 4	Acquire knowledge on sewage treatment and their disposal.	Lecture / Tutorial	Seminar
CO 5	Gain knowledge on bioremediation of toxic components in the environment.	Lecture / Case Studies	Seminar

Offered by | **Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Microbial ecosystem:** General ecological concepts - Ecosystem and habitats, species diversity in microbial habitats (population, community, species richness, species abundance). Terrestrial environment: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats.	1	20
	Instructional Hours		12
Suggested Learning Methods: Video lectures			
II	**Microbial interactions and applications:** Mutualism, commensalism, antagonism, competition, parasitism, predation, decomposition, bio-mining, nitrogen fixation (symbiotic). Disease in plants.	2, 3	2 & 7
	Role of microorganisms in nutrient cycling (Carbon, nitrogen, phosphorus and Sulphur).	3	4
	Instructional Hours		12
Suggested Learning Methods: Video lectures and Model presentation			
III	**Microorganisms and pollution:** General aspects of pollution, pollution by pathogenic microorganisms, pollution by oxygen demanding carbonaceous material, mineral pollutants, heat pollution, pollution by recalcitrant chemicals.	2	16 – 20

		Instructional Hours	12
Suggested Learning Methods: Model presentation and Video lectures			
IV	**Waste Management:** Outlines of solid waste management: sources and types of solid waste, methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.	2	26
		Instructional Hours	12
Suggested Learning Methods: Model presentation and Group discussion			
V	**Bioremediation:** Bioremediation of contaminated soil and marine oil pollutants. Degradation of pesticides - DDT and Propanil. Role of microbes in e-waste management and plastic degradation.	3	3
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
		Total Hours	60

Text Books	1. Madigan, B. and B.S. Stahl. **Brock Biology of Microorganisms**, 15th Edition, Perason, 2021. 2. Vijaya Ramesh K. **Environmental Microbiology**, MJP Publishers, 2017. 3. Grant WD., Long PF. **Environmental Microbiology**, Springer, 2013.
Reference Books	1. Watson, J.D., T.A. Baker, S.P. Bell, A. Gann, M. Levine and R. Losick. **Molecular Biology of the Gene,** Cold Spring Harbour Lab. Press, Pearson Pub., 7th edition, 2017. 2. De Robertis, E.D.P. and E.M.F. De Robertis. **Cell and Molecular Biology**, Lippincott Williams and Wilkins, Philadelphia, 8th edition, 2006.
Web. URLs	1. https://www.easybiologyclass.com/molecular-biology-online-tutorials-lecture-notes-study-materials/ 2. https://cdn.intechopen.com/pdfs/21996/InTech-Biodegradation_of_pesticides.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	H	M	M	H	M	H	M	L	L	M	H	L	H
CO2	M	M	M	H	M	H	H	M	M	M	H	M	H
CO3	M	H	H	M	H	M	H	M	M	H	M	L	M
CO4	H	H	M	H	H	M	H	H	H	M	H	M	M
CO5	M	H	H	H	M	H	H	H	H	L	H	M	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

Course code	Title		
23U3CNA303	Allied Paper III – Fundamentals of Computer Applications		
Semester: III	Credits: 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective	To make the students understand the basic concepts of information technology and MS office application
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	The course aims to transform knowledge on making use of essential computer applications which includes word processor, spreadsheets, presentations and introductory database skills.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the essential concepts of Information Technology	Lecture	Assignment
CO 2	Define document, formatting in word	Tutorial	Seminar
CO 3	Understand worksheet and workbook	Demonstration	Quiz
CO 4	Demonstrate slide presentation	Tutorial	Quiz
CO 5	Examine the methods of creating a presentation	Demonstration	Assignment

Offered by | **Computer Science**

Course Content	Instructional Hours / Week : 3

Unit	Description	Text Book	Chapters
I	**The Computer Era – An Introduction:** Introduction to information concepts and processing – Data – information – Need for information – Human being as information processor – Need for computerization – information technology – Components of information technology – hardware – software – data – user – storage – communication.	**1**	**1**
	Fundamentals of Computer System: What is a computer? – Characteristics of a computer – Intangible benefits	**1**	**2**
	Instructional Hours		**09**
Suggested Learning Methods: Group Learning			
II	**Creating documents with word:** Creating blank file – saving a file – file formats. **Formatting:** Character formatting – formatting techniques – the font group – the font dialog box – page setup basics – Table setup basics – Inserting picture from a file.	2	4, 5, 8, 9
	Instructional Hours		**09**
Suggested Learning Methods: You tube Videos			
III	**Using Excel Worksheets and Work Book:** Understanding workbooks and worksheets – moving around a worksheet – Entering text – entering date – modifying cell content – applying number formatting. **Essential worksheet and cell range:** Learning the fundamentals of excel worksheet - working with rows and columns – understanding cells and range – copying or moving ranges	2	12, 13, 14
	Instructional Hours		**09**

Suggested Learning Methods: Group Discussion / Demonstration			
IV	**Introducing formulas and functions:** Understanding formula basics – entering the formula – editing the formula – Basic counting formula – summing formula. **Getting started making charts:** What is a chart? – Creating a chart – Working with charts – Understanding chart types.	2	15, 17, 18
		Instructional Hours	**09**
Suggested Learning Methods: Chart Preparation			
V	**Creating a Presentation, slides and Text:** Starting a new presentation – Closing and reopening presentation – creating new slides – managing slides. **Working with table and charts:** Creating tables, Understanding charts and chart types	2	21, 23
		Instructional Hours	**09**
Suggested Learning Methods: Lecture / You tube Videos			
		Total Hours	**45**

Text Books	1. Chetan Srivastava, "**Fundamentals of Information Technology",** Kalyani Publishers, New Delhi, Edition 2002. 2. John Walkenbach, Herb Tyson, et al, **Office 2007 Bible**". Wiley India Pvt. Ltd, 2008.
Reference Books	1. John Walkenbach, **Excel 2007 Bible**". Wiley India Pvt. Ltd, 2007. 2. Amy Romanoff, Sherry Bonelli, "**Microsoft Office 2000 Complete Reference**", BPB Publication, New Delhi. 3. Sanjay Saxena "MS Office 2007 in a Nutshell", Vikas Publishing House, Noida, 2001. 4. Dinesh Maidasani, "Learning Computer Fundamentals, MS Office and Internet and Web Tech", Firewall Media, 2005.
Web. URLs	https://support.microsoft.com/en-us/training

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	M	H	H	M	H	-	-	-	-	M
CO2	M	M	M	M	H	M	M	H	-	-	-	-	L
CO3	H	H	M	H	M	M	H	M	-	-	-	-	M
CO4	M	H	L	M	H	H	M	H	-	-	-	-	L
CO5	M	M	H	H	M	H	H	M	-	-	-	-	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Mr. M. Senthil Kumar	Dr. N. Kavitha

Course Code	Title		
23U4MBS301	Skill based Paper I: Fundamentals of Bioinformatics		
Semester: III	Credits: 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective	To understand the major databases that is required to store the nucleic acid and DNA sequences and the information retrieval systems. The course also enables the students to gain knowledge of the genomic organization and the protein structures prediction.
Course Category	Employability and Skill Development
Development Needs	Global
Course Description	To provide a system level understanding of complex interactions within biological systems and to model the biological systems employing computational concepts.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Develop knowledge on basic concepts of bioinformatics and its significance in Biological data analysis.	Flipped classroom/Lectures	Assignment
CO 2	Gain knowledge about various biological databases that provide information about nucleic acids and protein information retrieval from NCBI, EMBL.	Lectures / Video Lessons	Seminar
CO 3	Gain knowledge of the analytical tools for sequences databanks: BLAST, FASTA, Pairwise alignment- Multiple alignment- ClustalW, PRAS.	Lectures / Group Discussion	Quiz
CO 4	Understand the structural organization, structural properties and various techniques employed in the structure determination of biological macromolecules – DNA and protein.	Lectures / Video Lessons	Seminar / Assignment
CO 5	Gain knowledge on protein folding, RNA prediction and its significance in Bioinformatics	Lectures and Flipped classroom	Seminar

Offered by Microbiology

Course Content **Instructional Hours / Week: 3**

Unit	Description	Textbook	Chapters
I	**Definition of Bioinformatics**: Scope applications and limitations. Biological databases – Types of Databases, Information Retrieval from biological databases. DNA and protein sequence data banks, NCBI, EMBL, DDBJ, SWISSPROT.	**1**	**1**
		Instructional Hours	**05**
Suggested Learning Methods : Group learning			
II	**Database of metabolic pathways:** Mode of data storage - File formats - FASTA, GenBank and Uniport, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniport, PDB.	3	4
		Instructional Hours	10
Suggested Learning Methods: Online demonstration			

III	**Sequence Alignment:** BLAST and its types, Global Alignment, Local Alignment, Parametric and Multiple Alignment algorithms, Needleman. **Phylogeny:** Introduction, Molecular clock, phylogenetic tree construction, nearest neighbourhood, Parsimony analysis. Phylogenetic tree construction (MEGA).	2	7, 8
		Instructional Hours	10
Suggested Learning Methods: Video Lectures			
IV	**Genome organization and analysis:** Diversity of Genomes: Prokaryotic & eukaryotic genomes, 2-D gel electrophoresis, SDS Page electrophoresis.	2	19
		Instructional Hours	10
Suggested Learning Methods: Group learning			
V	Homology Search, Protein structure prediction (Secondary & Tertiary), RNA Structure prediction, function prediction (proteins), Protein-protein interaction, e-PCR.	2	8
		Instructional Hours	10
Suggested Learning Methods: Online demonstration			
		Total Hours	45

Text Books	1.Gautam B. Singh, Fundamentals of Bioinformatics and Computational Biology, Springer Cham Heidelberg, New York, 2015. 2.Vittal R. Srinivas, Bioinformatics: A Modern Approach, PHI Learning Private Limited, New Delhi, 2005 3.Subramanian Mathura and Pandjassarame Kangueane, Bioinformatics: A Concept Based Introduction, Springer, New York, 2009.
Reference Books	1. Hepsyba, S.G.H. and C.R. Hemalatha, 2009. Basic Bioinformatics, MJP Publishers, Chennai.
Web. URLs	1. https://thebiologynotes.com/biological-databases-types-and-importance/ 2. https://thebiologynotes.com/category/bioinformatics/.

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	M	M	H	H	L	M	L	L	M
CO2	H	M	M	H	M	H	H	H	M	L	L	L	H
CO3	H	H	H	H	H	M	H	H	H	H	L	L	M
CO4	M	H	M	M	M	H	H	H	H	H	M	-	H
CO5	H	H	H	H	H	H	H	H	M	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. K. E. Vivekanandan	Dr. M. Thangavel

Course Code	Title	
22U4NM3BT1	Part IV : Basic Tamil – I (அடிப்படைத்தமிழ் - I)	
Semester: III	Credits: 2	CIA: 50 Marks

(Common to all UG Programmes)

Course Objective	தமிழ் மொழியைக் கற்பித்தல்–மொழித்திறனை வளர்த்தல்.
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)
Development Needs	Regional (தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	தமிழ் எழுத்துக்கள் அறிமுகம் செய்தல் மற்றும் வாசித்தல் ஆகியவற்றின் பயன்பாடு.	குழு விவாதம்	ஒப்படைவு
CO 2	பிறமொழி கற்றல் ஆர்வம் தூண்டல்.	குழு விவாதம்	கருத்தரங்கு
CO 3	பிறமொழி அறிவுத் திறன் மேம்படச்செய்தல	விரிவுரை/ காணொளிப்பட விளக்கம்	குழுத்திட்டம்
CO 4	வார்த்தை அமைக்கும் திறன் பெறச்செய்தல்.	விரிவுரை/ குழு விவாதம்	குழுத்திட்டம்
CO 5	கையெழுத்துத்திறன் பெறச்செய்தல்.	குழு விவாதம்	குழுத்திட்டம்

Offered by தமிழ்த்துறை

Course Content : Basic Tamil – I அடிப்படைத்தமிழ் - I — **Instructional Hours / Week : 2 Hours**

Unit	Description	Text Book	Chapters
I	தமிழ் மொழியின் அடிப்படைக் கூறுகள்	இலக்கணம்	1.உயிர்எழுத்துக்கள் 2.மெய் எழுத்துக்கள் 3.உயிர்மெய் எழுத்துக்கள்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : எழுத்துக்களை எழுதும் மற்றும் வாசிக்கும் திறன் பெற்றமை			
II	சொல் அமைத்தல்	இலக்கணம்	1.ஓர் எழுத்து ஒருமொழி 2.இரண்டுமுதல் ஐந்து எழுத்துச்சொற்கள் 3.தமிழ் மாதங்கள் பெயர்,கிழமைகளின் பெயர் 4.வண்ணங்கள் பெயர், 5.சொல் ஆக்கம்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : எழுத்துக்களை கொண்டு சொற்களை உருவாக்கும் பயிற்சி பெற்றமை			
III	தொடரமைப்பு	தொடரமைப்பு	1.எழுவாய் 2.செயப்படுபொருள்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : சொற்களைக் கொண்டு தொடர் உருவாக்கும் பயிற்சி பெற்றமை			
IV	குறிப்பு எழுதுதல்	இலக்கணம்	1.தொடரமைப்பு 2.பத்தி அமைப்பு
		Instructional Hours	**6 Hours**
Suggested Learning Methods : பத்தி அமைப்பு உருவாக்கும் திறன் பெற்றமை			

V	பிழைநீக்குதல்	இலக்கணம்	1.ஒற்றுப்பிழை 2.வாக்கியப் பிழை
		Instructional Hours	**6 Hours**
Suggested Learning Methods : இலக்கணப் பிழை இன்றி எழுதும் திறன் பெற்றமை			
		Total Hours	**30 Hours**

Text Books	1. இளங்கலை தமிழ் மாணவர்களுக்குரிய பாடநூல்"அரிச்சுவடி" தொகுப்பு: தமிழ்த்துறை,நேரு கலை மற்றும் அறிவியல் கல்லூரி,கோயம்புத்தூர்.
Reference Books	1. பவணந்தி முனிவர்,நன்னூல் பூலியூர்க்கேசிகன் உரை,சாரதா பதிப்பகம், சென்னை–40. 2. தொல்காப்பியம், கணேசையர் பதிப்பு,உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை -113.
Web. URLs	https://youtu.be/P7vvUnjI6vY, https://youtu.be/Zx4R3yZseuQ.

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
8	8	10	8	8	8	50

Mapping

CO/PO	PO 1	PO2	PO3	PO4	PO 5	PO6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO1	L	L	H	L	H	M	H	H					
CO2	M	L	H	L	M	M	L	H					
CO3	H	L	H	L	L	M	M	H					
CO4	H	L	M	L	L	M	H	M					
CO5	M	L	H	L	M	M	H	H					

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. S. Satheesh kumar	Dr. A. Sridevi

Course Code	Title	
22U4NM3AT1	Part IV: Advanced Tamil – I (சிறப்புத்தமிழ் -I)	
Semester: III	Credits: 2	ESE: 50 Marks
Course Objective	புதுக்கவிதை உருவாக்கும் திறன் வளர்த்தல் - மொழித்திறனை மேம்படுத்துதல்	
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)	
Development Needs	Regional (தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)	
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்	

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	புதுக்கவிதை படைக்கும் திறன்வளர்த்தல்	விரிவுரை	குழுத்திட்டம்
CO 2	படைப்பாக்கத்திறன் அறிவு பெறச்செய்தல்.	விரிவுரை / குழு விவாதம்	கருத்தரங்கு
CO 3	தகவல் தொடர்பியலுக்கான கடிதம்,அமைவுத்திறன் பெறச்செய்தல்	விரிவுரை / காணொளிப்பட விளக்கம்	கருத்தரங்கு
CO 4	மொழியைப் பிழையின்றிப் பேசும் ,எழுதும் திறன் பெறச் செய்தல்	விரிவுரை	ஒப்படைவு
CO 5	கடிதம் எழுதுதல் மற்றும் மொழியறிவைப் பெறுதல்.	விரிவுரை / காணொளிப்பட விளக்கம்	குழுத்திட்டம்

Offered by	தமிழ்த்துறை

Course Content: Advanced Tamil - I (சிறப்புத்தமிழ் -I)	Instructional Hours / Week : 2 Hours

Unit	Description	Text Book	Chapters
I	புதுக்கவிதை	1. பாரதியார் 2. பாரதிதாசன்	1.1.தேசபக்திபாடல் தாயின் மணிக்கொடி பாரீர் 1.2.பாரதிதாசன்(தமிழ்மொழிபற்று- கனியிடை,தமிழுக்கும் அமுதென்று)
		Instructional Hours	6 Hours
Suggested Learning Methods : கவிதை எழுதும் திறன் பெற்றமை			
II	பிழை நீக்குதல்	இலக்கணம்	2.1.சொற்பிழை நீக்கம் 2.2.தொடர் பிழை நீக்கம் 2.3.பத்தி எழுதச் செய்தல்
		Instructional Hours	6 Hours
Suggested Learning Methods :வாக்கியங்களைப் பிழை இன்றி எழுதும் திறன் பெற்றமை			
III	இலக்கணப் பயிற்சி அளித்தல்	இலக்கணம்	3.1.தொகை நிலைத்தொடர், 3.2.தொகா நிலைத்தொடர் 3.3.ஆகுபெயர் வகைகள்

		Instructional Hours	**6 Hours**
Suggested Learning Methods : இலக்கணப் பிழை இன்றி எழுதும் பயிற்சி பெற்றமை			
IV	கடிதம் எழுதுதல்	இலக்கணப் பயிற்சி ஏடு	4.1. பாராட்டுக்கடிதம் 4.2. நன்றிக்கடிதம் 4.3. அழைப்புக்கடிதம் 4.4. அலுவலகக் கடிதம் 4.5. நட்புக்கடிதம்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : கடிதம் எழுதும் திறன் பெற்றமை			
V	இலக்கிய வரலாறு	தமிழ் இலக்கிய வரலாறு	1.வேலு நாச்சியார் 2.கப்பலோட்டிய தமிழன்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : தமிழ் இலக்கிய வரலாற்றின் சிறப்பினை அறிய பெற்றமை			
		Total Hours	**30 Hours**

Text Books	1. இளங்கலை தமிழ் மாணவர்களுக்குரிய பாட நூல்"திரட்டு"தமிழ்த்துறை. தொகுப்பு: தமிழ்த்துறை,நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.
Reference Books	1. பாரதியார்- பாரதியார் கவிதைகள், அபிராமி பதிப்பகம், 7- பி, கொடிமரத் தெரு, சென்னை– 013. 2. பவணந்தி முனிவர் – நன்னூல் புலியூர்க்கேசிகன் உரை, சாரதா பதிப்பகம், சென்னை -040.
Web. URLs	https://youtu.be/xnsvFOHxDeo, https://youtu.be/kQoIj-29VIk.

Course designed by	**Verified by**
Dr. S. Satheesh kumar	Dr. A. Sridevi

Course Code	Title	
22U4NM3CAF/ 21U4NM3CAF	Non Major Elective : Consumer Affairs	
Semester : III	Credits : 2	ESE : 50 Marks
(Common to all UG Programmes)		
Course Objective	To enable the students to understand the concepts of Consumers and Markets	
Course Category	Employability	
Development Needs	National & Global	

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Know their rights and responsibilities as a consumer	Lecture/ Video Lectures	Assignment
CO 2	Gain knowledge about Consumer protection law in India	Lecture/ Peer Teaching	Seminar
CO 3	Understand the procedure about redressed of consumer complaints	Lecture/ Group Discussion	Seminar
CO 4	Learn about Consumer related regulatory agencies and Norms	Lecture/ Role Play	Assignment
CO 5	Comprehend Business Firms, Interface with Consumers.	Lecture/ Group Discussion	Quiz

Offered by | **Department of Business Administration**

Course Content | **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Conceptual Framework - Consumer and Markets:** Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology. Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process.	1	1 & 2
		Instructional Hours	**6**
Suggested Learning Methods : Video lectures			
II	**The Consumer Protection Law in India** **Objectives and Basic Concepts:** Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice.	1	5 & 6
		Instructional Hours	**6**
Suggested Learning Methods : Peer Teaching			

III	**Grievance Redressal Mechanism under the Indian Consumer Protection Law** Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal f cases, Relief/Remedy available; Temporary Injunction, Offences and penalties.	2	1
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
IV	**Role of Industry Regulators in Consumer Protection -** Industry self-regulation (ISR) Protection Policies, Consumer Protection Agencies i. Telecommunication: TRAI ii. Food Products: FSSAI Insurance : IRDA and Insurance Ombudsman	2	4
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			
V	**Contemporary Issues in Consumer Affairs** **Consumer Movement in India:** Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing. **Quality and Standardization:** Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance.	2	6 & 7
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
		Total Hours	**30**

Reference Books	1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press. 2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	-	-	-	M	H	H	M	M	-	-	-	-
CO2	L	-	-	-	M	H	H	M	M	-	-	-	-
CO3	L	-	-	-	M	H	M	M	M	-	-	-	-
CO4	L	-	-	-	M	H	H	M	M	-	-	-	-
CO5	L	-	-	-	M	H	H	M	M	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. T. Sudha	Dr. T. Sudha

Course Code	Title	
22U4NM3GST	Non Major Elective : Gender Sensitization	
Semester : III	Credits : 2	ESE : 50 Marks

(Common to all UG Programmes)

Course Objective	To raise awareness of gender, promote gender equality, and equip learners with key concepts and principles of gender sensitization.
Course Category	Skill Development, Employability and Entrepreneurship
Development Needs	Local, National and Global
Course Description	The course aims an exploration of overview of gender, its social construction, gender issues and challenges in India, and equips learners with key concepts and principles of gender sensitization to promote inclusivity and equity.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Learn gender roles, socialization, and stereotypes.	Direct Instruction	Assignment
CO 2	Recognize the gender discrimination causes, areas, and levels in institutions.	Direct Instruction	Seminar
CO 3	Identify the gender identity formation, types, families, and socialization in India.	Video Lessons	Assignment
CO 4	Understand the gender concerns in access, enrollment, retention, participation, and achievement.	Direct Instruction	Assignment
CO 5	Apply the Laws Related to Women	Direct Instruction	Exhibition

Offered by | **Department of Costume Design and Fashion**

Course Content | **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Gender Socialisation and Gender Roles:** Introduction- Meaning of Sex and Gender, Gender Socialisation– Definitions, Agents of Gender Socialisation, Gender Roles- Meaning, Definitions, Nature of Gender Roles, Factors Determining Gender Roles/Stereotypes	1	-
	Instructional Hours		**6**
Suggested Learning Methods : Group discussions			
II	**Gender Discrimination:** Gender Discrimination - Meaning and Causes of Gender Discrimination, Areas of Gender Discrimination, Gender Discrimination at Different Levels of Institutions	1	-
	Instructional Hours		**6**
Suggested Learning Methods : Video documentaries and films			
III	**Gender Identity:** Gender Identity - Meaning, Formation and Factors of Gender Identity, Types of Gender Identity, Types of Families in India, Gender Socialisation within Indian Families	1	-
	Instructional Hours		**6**
Suggested Learning Methods : Case Method			

IV	**Gender Concerns:** Gender Concerns Related to Access, Enrolment, Retention, Participation, and Achievement	1	-
		Instructional Hours	**6**
Suggested Learning Methods : Video documentaries and films			
V	**Laws Related to Women:** Laws Related to Rape, Laws Related to Dowry - Dowry Prohibition Act, 1961, Laws Related to Remarriage, Laws Related to Divorce, Laws Related to Property Inheritance, Laws Related to Trafficking, Constitutional and Legal Aspects related to Women - Women's Reservation Bill – History and Current Status	1	-
		Instructional Hours	**6**
Suggested Learning Methods : Case Method			
		Total Hours	**30**

Text Books	1. Gender School and Society : Self-learning Material, MANGALORE UNIVERSITY, Printed at Datacon Technologies, Bangalore, 2018
Reference Books	1. United Nations Development Programme. (2014). Gender Equality and Women's Empowerment: Training Manual. New York: UNDP.
Web. URLs	1. Coursera - https://www.coursera.org/courses?query=gender%20sensitization 2. edX - https://www.edx.org/learn/gender-sensitization 3. Udemy - https://www.udemy.com/topic/gender-sensitization/

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	M	H	H	M	-	-	-	-	-
CO2	H	M	M	M	H	H	M	M	-	-	-	-	-
CO3	H	M	M	M	M	H	H	M	-	-	-	-	-
CO4	H	M	M	M	L	H	H	M	-	-	-	-	-
CO5	H	M	M	M	M	H	M	M	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. M. Nandhini	Dr. S. Jayapriya

Course Code	Title	
22U4NM3WRT / 21U4NM3WRT	Non Major Elective : Women's Rights	
Semester : III	Credits : 2	ESE : 50 Marks
(Common to all UG Programmes)		
Course Objective	To facilitate the awareness about the social, economical, political, intellectual or cultural contributions of Women in India.	
Course Category	Skill Development	
Development Needs	National	
Course Description	Apply the knowledge of Rights related to women for their betterment.	

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Aware of basic constitutional rights	Lecture/ Case Study/ Role Play	Seminar
CO 2	Gain awareness on Political rights	Lecture/ Case Study/ Role Play	Role Play
CO 3	Understand individual and familial rights	Lecture/ Case Study/ Role Play	Role Play
CO 4	Grasp the provisions for Women's Rights in India	Lecture/ Case Study/ Role Play	Role Play
CO 5	Develop an understanding of the Protection Mechanisms for women	Lecture/ Case Study/ Role Play	Assignment

Offered by	Department of Social Work

Course Content	Instructional Hours / Week : 2

Unit	Description	Text Book	Chapters
I	**Constitutional Rights of Women in India**: Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality – rights against exploitation cultural and educational rights - the right to constitutional remedy - University Declaration of Human Rights -Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	4	2
		Instructional Hours	**6**
Suggested Learning Methods : Seminar			
II	**Political Rights of Women in India:** Political Rights of Women in India - Electoral process – women as voters - candidates and leader - pressure group, 73rd and 74th amendment and representation of women in local self –government – women in Rural and urban local bodies - Reservation of women - party ideologies and women's issues.	5	1
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			

III	**Women's Rights: Access to Justice:** Introduction – Criminal Law – Crime Against Women Domestic Violence – Dowry Related Harassment and Dowry Deaths - Molestation – Sexual Abuse and Rape Loopholes in Practice–Law Enforcement Agency	3	7
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			
IV	**Women's Rights:** Violence Against Women – Domestic Violence The Protection of Women from Domestic Violence Act 2005, The Marriage Validation Act 1982 - The Hindu Widow Remarriage Act 1856 - The Dowry Prohibition Act 1961.	3	5
		Instructional Hours	**6**
Suggested Learning Methods : Creative Art Assignments			
V	**Special Women Welfare Laws:** Sexual Harassment at Work Places, Rape and Indecent Representation, The Indecent Representation (Prohibition) Act, 1986, Immoral Trafficking, The Immoral Traffic (Prevention) Act, 1956 - Acts Enacted for Women Development and Empowerment, Role of Rape Crisis Centers. Protection of Children from sexual Offences Act 2012.	3	9
		Instructional Hours	**6**
Suggested Learning Methods : Community Participation Program			
		Total Hours	**30**

Reference Books

1. P. D. Kaushik "Women Rights" Book well Publication 2007 UN Centre for Human Rights, Discrimination against Women (Geneva: World Campaign for Human Rights,1994).
2. Agnes, Flavia. (1992). "Give us "Give us This Day Our Daily Bread: Procedures and Case Law on Maintenance". Majlis, Bombay.
3. Agnes, Flavia. (1999). "Law and Gender Inequality: The Politics of Women"s Rights in India". OUP, New Delhi

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	M	H	M	M	M					
CO2	H	M	M	H	M	M	H	H					
CO3	H	M	M	H	M	H	M	M					
CO4	M	H	M	H	M	M	M	H					
CO5	H	M	M	H	M	H	M	M					

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. P. Nathiya	Dr. P. Nathiya

Course Code	Title	
23U4MB3ED1	Extra Departmental Course I- Mushroom Cultivation Technology	
Semester: IV	Credits:2	ESE:50 Marks

Course Objective	Able to cultivate in a limited space and describe the cultivation process. To get the knowledge on the mushroom cultivation technology and their significance of mushroom cultivation technology. The interested students will get the knowledge on cultivation. They can generate employments. They will also turn towards the steps in mushroom cultivation. Will get the knowledge on nutritional value of mushroom.
Course Category	Entrepreneurship and skill development
Development Needs	Global
Course Description	The course aims at making the students to gain knowledge and skills in developing their own cultivation unit by using the skills and technology in developing their own startup

Course Outcomes		Teaching Methods
CO 1	Understand structure and importance of edible mushroom, differentiate edible and poisonous mushrooms.	Video Lectures
CO 2	Acquire knowledge about reproduction and cultivation of mushrooms.	Lectures / Video Lessons
CO 3	Gain information on mushroom cultivation houses.	Lectures / Group Discussion
CO 4	Know how to harvest and utilize the mushrooms.	Lectures / Video Lessons
CO 5	Recognize various types of recipes preparation using mushroom.	Lectures and Flipped classroom

Offered by Microbiology

Course Content **Instructional Hours / Week: 2**

Unit	Description	Text Book	Chapters
I	**Background to Mushrooms**: Common Features, Types and Uses, Edible Mushrooms, Non-edible and Poisonous Mushrooms, Common Features to note on Poisonous Mushrooms, Uses of Mushrooms, Importance of Mushrooms, Biological Efficiency	1	1
	Instructional Hours		**03**
Suggested Learning Methods :**Hands on training**			
II	**Biology of Mushrooms**: Reproduction in Fungi, Fungal Growth Factors, Nutrition of Mushrooms, Types of oyster mushrooms, Types of button mushroom, Substrate Definition, Cultivation of Oyster Mushrooms: Collecting of substrate, Drying of substrate, Chopping of substrate, Watering of the substrate, Pasteurization, Spawning.	1	2
	Instructional Hours		04
Suggested Learning Methods: Field Visit			
III	**Mushroom Houses**: Materials for constructing a mushroom house, maintaining and monitoring the mushroom house, Production cycle, Waste management and recycling, Trouble shooting.	2	7

		Instructional Hours	10
Suggested Learning Methods: Hands on training			
IV	**Harvest, Utilization**: Utilization of Spent Mushroom Substrate, Harvesting and Preservation of Mushrooms. Pests and Diseases. Packaging of mushrooms.	1	6
		Instructional Hours	10
Suggested Learning Methods: Hands on training			
V	**Mushroom Recipes**: Mushroom soup, Chicken Mushroom, Mushroom Curry.	2	12
		Instructional Hours	3
Suggested Learning Methods : Field visit			
		Total Hours	30

Text Books	1. ChenjerayiKashangura, Edna Kunjeku, Audrey Mabveni, Tsungai Chirara, Arnold Mswaka, VimbaiManjonjo-Dalu. **Manual for Mushroom Cultivation**. Biotechnology Trust of Zimbabwe, 2004. 2. Nailoke Pauline Kadhila-Muandingi, Fabian SinvulaMubiana, Keumbo Lorna Halueendo. **Mushroom Cultivation: A Beginners Guide**. 2nd edition, University of Namibia, 2008.
Reference Books	1. Gregoire Pesti. **Mushrooms Cultivation, Antioxidant Properties and Health Benefits**. Nova Science Pub Inc., 2014. 2. Philip G. Miles, Shu-Ting Chang. **Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact**, 2nd edition, CRC Press, 2004.
Web. URLs	1. https://www.biologydiscussion.com/fungi/mushrooms-meaning-values-and- cultivation-procedure/46635 2. https://www.yourarticlelibrary.com/mushrooms/mushrooms-cultivation-procedure-for-mushrooms-cultivation-1703-words/7268

Course designed by	**Verified by Chairman**
Dr. P. Vinoth Kumar	Dr. M. Thangavel

Course Code	Title	
23U4MB3ED2	Extra Departmental Course II - Vermitechnology	
Semester: VI	Credits: 2	ESE: 50 Marks
Course Objective	Able to prepare compost in a limited space and describe the decomposing process. The interested students will get the knowledge of composting. They can generate employments. They will also turn towards organic farming. Will help to maintain the environment pollution free and will get the knowledge of biodiversity of local earthworms.	
Course Category	Entrepreneurship and skill development	
Development Needs	Global	
Course Description	The course aims at making the students to gain knowledge and skills in developing their own compost unit by using the skills and technology in developing their own startup	

Course Outcomes		Teaching Methods
CO 1	Understand importance of Vermitechnology.	Video Lectures
CO 2	Acquire knowledge on role of earthworms.	Lectures / Video Lessons
CO 3	Gain information on vermicompost processing.	Lectures / Group Discussion
CO 4	Know how to feed and monitor to prepare vermicompost.	Lectures / Video Lessons
CO 5	Know harvest and packaging technology of vermicompost.	Lectures and Flipped classroom

Offered by	Microbiology

Course Content	Instructional Hours / Week: 2

Unit	Description	Text Book	Chapters
I	Vermiculture and Vermicomposting: Green Revolution, Chemical Fertilizers, Composting, Vermicomposting, difference between vermiculture and vermicomposting, Advantages of vermicomposting, Vermitechnology and its importance	1	1 (a-h)
		Instructional Hours	**03**
Suggested Learning Methods: **Hands on training**			
II	**Earth worm and vermicomposting**: Earthworms description, Geographical distribution of earthworms, Classification of earthworms, Biology of Earthworms - Anatomy and Physiology Basics, Amazing Earthworm Facts, Ecological Groups and Species, Earthworm Reproduction, Earthworm Needs for Vermicomposting	1, 2	1 (i-q), 3
		Instructional Hours	04
Suggested Learning Methods: Field Visit			
III	**Vermicomposting Process**: Parameters for Choosing a System, Space Requirements, Types of Vermi-Systems, Covering the Bed, Accessing the Worm Bed, Bedding Options and Preparation, Adding Earthworms to Your Vermi-System, Utility Needs, Safety.	2	5
		Instructional Hours	10
Suggested Learning Methods: Hands on training			

IV	Feedstock Options, developing a Feedstock Recipe, Processing Feedstocks, Testing New Feedstocks, Worm Feed Characteristics, Pre-Composting Feedstocks, Feeding Schedule, Applying Feedstocks to the Bed, The Daily Inspection, Moisture Control, Temperature Control,	2	7
		Instructional Hours	10
Suggested Learning Methods: Hands on training			
V	Harvesting and Packaging: Manual Earthworm Removal, Vermicast Harvesting, Packaging and Shipping Earthworms, Vermicast: Quality, Stability, and Maturity of Products.	2	4
		Instructional Hours	3
Suggested Learning Methods: Field visit			
		Total Hours	30
Text Books	1. Avnish Chauhan, Vermitechnology, Vermiculture, Vermicompost and Earthworms. Lap lambert Academic publishing, 2012. 2. Rhonda Sherman, The Worm Farmer's Handbook. Chelsea Green Publishing, 2018.		
Reference Books	1.Sreenivasan E., Handbook of Vermicomposting Technology. The Western India Plywoods Ltd., 2015. 2. Glenn Munroe, Manual of On-Farm Vermicomposting and Vermiculture, Organic Agriculture Centre of Canada, 2005.		
Web. URLs	1. https://www.onlinebiologynotes.com/vermicomposting/ 2. https://www.vedantu.com/biology/vermiculture		

Course designed by	**Verified by Chairman**
Dr. K. E. Vivekanandan	Dr. M. Thangavel

SEMESTER IV

23U1TAM404	Part - I : Muthamizh (முத்தமிழ்)		
Semester: IV	**Credits: 3**	**CIA: 20 Marks**	**ESE: 55 Marks**
Course Objective	சங்ககால மக்களின் வாழ்வியல் வாயிலாக பண்பாட்டுக் கூறுகளை உணர்த்துதல		
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)		
Development Needs	Global/Regional (உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)		
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல் மற்றும் உலக அளவில் தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்		

Course Outcomes		**Teaching Methods**	**Assessment Methods**
CO 1	தமிழர்களின் வாழ்வியல் பண்புகளைக் கற்று அறிதல்.	விரிவுரை/காணொளிப் பட விளக்கம்	ஒப்படைவு
CO 2	தமிழ் இலக்கிய வகைகளைக் கூறுவதன் மூலம் தமிழின் இலக்கிய வளத்தை உணரச்செய்தல்.	விரிவுரை	குழுத்திட்டம்
CO 3	மாணவர்களிடையே காலத்திற்கேற்ப மனவளர்ச்சியை உருவாக்குதல்.	விரிவுரை/காணொளிப் பட விளக்கம்	கருத்தரங்கு
CO 4	நாட்டின் சிறந்த குடிமக்களாக மாணவர்களை உருவாக்குதல்.	விரிவுரை	ஒப்படைவு
CO 5	மாணவர்களின் மனநலத்தை வளர்த்தல்.	விரிவுரை/குழு விவாதம்	கருத்தரங்கு

Offered by தமிழ்த்துறை

Course Content: Muthamizh (முத்தமிழ்)			**Instructional Hours / Week : 4**
Unit	**Description**	**Text Book**	**Chapters**
I	எட்டுத்தொகை	1. நற்றிணை 2. குறுந்தொகை 3. பதிற்றுப்பத்து 4. புறநானூறு	1.1 குறிஞ்சி: நின்ற சொல்லார் .., 1.2 முல்லை : இளமை பாரார் ..., குறிஞ்சி : நிலத்தினும்..., பாலை :ஆடு அமை ...விளையாட்டு ஆயமொடு 1.3 ஐந்தாம் பத்து : ஊன் தூவை அடிசில் 1.4. யாதும் ஊரே .. பல் சான்றீரே .., அற்றைத்திங்கள்
			Instructional Hours **12 Hours**
Suggested Learning Methods: சங்க இலக்கிய வழி நற்பண்புகளை அறியச்செய்தல்			
II	பத்துப்பாட்டு	1.சிறுபாணாற்றுப்படை 2.குறிஞ்சிப்பாட்டு 3.பொருநர்ஆற்றுப்படை 4.மதுரைக்காஞ்சி	2.1 கடையெழு வள்ளல்கள் சிறப்பு 2.2 அறத்தொடு நிற்றல் 2.3 மன்னனின் விருந்தோம்பல் 2.4 பாண்டிய நெடுஞ்செழியன் குடிச்சிறப்பு
			Instructional Hours **12 Hours**
Suggested Learning Methods : புலவர்களின் மாண்புகளை வெளிப்படுத்துதல்			
III	அற இலக்கியங்கள்	1. நான்மணிக்கடிகை 2. இனியவை நாற்பது 3. களவழி நாற்பது- 4. ஆசாரக்கோவை	விளம்பிநாகனார் - (1-5 பாடல்கள்) பூதஞ்சேந்தனார் - (1-5 பாடல்கள்) பொய்கையார் - (11-15பாடல்கள்) பெருவாயின் முள்ளியார் (1-5 பாடல்கள்)
			Instructional Hours **12 Hours**
Suggested Learning Methods : அற இலக்கியங்களின் மாண்புகளை அறிய பெற்றமை			
IV	தமிழ்ச் செயலிகள்	தனித்தமிழ்	4.1 செயலிகள் அறிமுகம் 4.2 வகைகள்

			4.3 மொழிபெயர்ப்புச் செயலிகள் 4.4 தமிழ்ச் செயலிகள்
Instructional Hours			**12 Hours**
Suggested Learning Methods : தமிழ்ச் செயலிகள் பற்றி அறியும் வாய்ப்பு பெற்றமை			
V	இலக்கணம்	1.நன்னூல் 2.தொல்காப்பியம்	5.1 முதற்பொருள், கருப்பொருள், உரிப்பொருள் 5.2 பத்து அழகு 5.3 பத்து குற்றம் 5.4 ஆங்கிலத்திலிருந்து தமிழில் மொழிபெயர்த்தல்
Instructional Hours			**12 Hours**
Suggested Learning Methods : இலக்கண மாண்புகளை அறியும் திறன் பெற்றமை			
Total Hours			**60 Hours**

Text Books	1. இளங்கலை முதலாம் ஆண்டு தமிழ் மாணவர்களுக்குரிய பாடநூல் தொகுப்பு: "முத்தமிழ்" தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.
Reference Books	1. சங்க இலக்கியங்கள் - எட்டுத்தொகை, பத்துப்பாட்டு கழக வெளியீடு, திருநெல்வேலி. 2. தனித்தமிழ்- இளசுந்தரம், விகடன் பிரசுரம். சென்னை.
Web. URLs	https://youtu.be/GrNnb68Fd6w , https://youtu.be/14-sEAUzXP8 .

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
4	4	5	2	2	3	20

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	**L**	H	L	H	H	M	H					
CO2	M	**L**	H	L	M	L	M	H					
CO3	H	**L**	H	L	H	H	M	H					
CO4	M	**L**	M	L	H	H	H	M					
CO5	H	**L**	L	L	M	H	L	M					

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. S. Satheesh kuma	Dr. A. Sridevi

Course Code	Title		
23U1HIN404	Part – I : Prayogik Hindi		
Semester : IV	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			

Course Objective	साक्षरता प्रशंसा और विश्लेषण के सौंदर्य, सांस्कृतिक और सामाजिक पहलुओं के प्रति छात्रों को संवेदनशील बनाना | उन्हें विभिन्न कालों के प्रख्यात लेखकों के हिंदी कथा साहित्य के बेहतरीन नमूने उपलब्ध कराना |
Course Category	Skill Development
Development Needs	Global
Course Description	Improved accuracy & quality, improved communication

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	छात्र हिंदी भाषा से अच्छी तरह वाकिफ हो सकेंगे।	Smart boards and Role play	Assignment
CO 2	पाठ्यक्रम संवादी हिंदी में पारंगत होने में मदद करता है।	Group learning Acting and Story Narration	Seminar
CO 3	छात्र आधुनिक हिंदी साहित्य का ज्ञान प्राप्त कर सकेंगे।	Smart boards and YouTube Videos	Assignment
CO 4	छात्रों को निबंध लेखन में अच्छा अभ्यास मिलेगा।	Group learning and Work sheets	Group Project
CO 5	छात्रों को फिल्म की समीक्षा करने का अभ्यास मिलेगा।	Worksheets and Exercises	Seminar

Offered by : **Hindi**

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	विरुद्ध उपन्यास: (मृणाल पाण्डे)	1	4
	Instructional Hours		**12**
Suggested Learning Methods : Visual Learning			
II	कथा माला : लौटना और लौटना (मृदुला गर्ग) , ममता (जयशंकर प्रसाद), आदमी का बच्चा (यशपाल)	1	3
	Instructional Hours		**12**
Suggested Learning Methods : Auditory			
III	1. दिए गए अनुच्छेद पर समीक्षा लिखना 2. आधुनिक काल: प्रवृतियां और कवि	1	3
	Instructional Hours		**12**
Suggested Learning Methods : Comprehensive Writing			

IV	1. सामान्य निबंध : आधुनिक शिक्षा प्रणाली , मोबाइल का दुष्परिणाम, आधुनिक युवा पीढ़ी 2. हिंदी में दी गई कहानी के लिए सारांश लिखना।	1	2
		Instructional Hours	**12**
Suggested Learning Methods : Auditory, Visual, Comprehensive			
V	सिनेमा समीक्षा : पद्मावत	1	4
		Instructional Hours	**12**
Suggested Learning Methods : Comprehensive writing			
		Total Hours	**60**

Text Books	1. विरुद्ध उपन्यास: (मृणाल पाण्डे) 2. कहानी कुंज , गोविंद प्रकाशन , मथुरा 3. हर हाल बेगाने - मृदुला गर्ग , राजपाल एंड संस , दिल्ली 4. मेरा परिवार , लोकभारत प्रकाशन , इलाहाबाद
Reference Books	1. संजय चौहान , समकालीन हिंदी साहित्य विचार और विवाद , आशा किताबें 2. श्री रामदेव, व्याकरण प्रदीप, लोकभारती प्रकाशन, अलाहाबाद 3. डॉ वासुदेव नंदन प्रसाद, आधुनिक हिंदी व्याकरण और रचना, भारती भवन प्रकाशक 4. ओंकार नाथ वर्मा , सामान्य हिंदी , अरिहंत प्रकाशन भारत लिमिटेड
Web. URLs	1. www.webdunia.com 2. www.hindikunj.com 3. hindi-natak-vikas.html 4. www.bhashaindia 5. www.hindisamay.com 6. https://ebook.pustak.org/

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	M	L							
CO2	-	-	H	H	L	H							
CO3	-	-	-	L	L	H							
CO4	-	-	M	M	H	L							
CO5	-	-	L	L	H	L							

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Swarnalatha	Dr. S. Swarnalatha

Course Code	Title		
23U1MAL404	Part – I : Drisyakalaa Saahithyam		
Semester : IV	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	സിനിമ എന്ന മാധ്യമത്തിന്റെ വിവിധ തലങ്ങളെ ആഴത്തിൽ മനസ്സിലാക്കാൻ കഴിയുന്നു.ദൃശ്യാവിഷ്ക്കരണത്തെ കുറിച്ചുള്ള അറിവ് ലഭിക്കുന്നു.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	Proper guidance, opportunities and encouragement that help them achieve their ambitions		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	തിരക്കഥയിലെ സംഭാഷണത്തിന്റെ പ്രസക്തി	Lecture / Video Methods	Assignment
CO 2	മനക്കരുത്തിലൂടെ വീട്ടിലെ എല്ലാ അംഗങ്ങളെയും ദുഃഖം അറിയിക്കാതെ മംഗളകർമ്മം നടത്തുന്നു.	Group Learning	Seminar
CO 3	കുടുംബത്തിന്റെ തകരുന്ന മൂല്യത്തെ ഉയർത്തുന്നു	Peer Teaching	Assignment
CO 4	ദൃ ശ്യാവിഷ്ക്കരണം മലയാളത്തിൽ	Group Learning	Group Project
CO 5	രംഗവേദിയുടെ അവതരണം	Lecture / Dumb Charades	Assignment

Offered by	Department of Malayalam
Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	തിരക്കഥ - ഞാൻ പ്രകാശൻ	1	5
		Instructional Hours	12
Suggested Learning Methods : Visual Learning			
II	തിരക്കഥ - ഞാൻ പ്രകാശൻ	1	5
		Instructional Hours	12
Suggested Learning Methods : Auditory, Visual			
III	തിരക്കഥ - ഞാൻ പ്രകാശൻ	1	3
		Instructional Hours	12
Suggested Learning Methods : Visual Learning			

IV	നാടകം - ഭരതവാക്യം	1	2
		Instructional Hours	**12**
Suggested Learning Methods: Auditory, Visual			
V	നാടകം - ഭരതവാക്യം	1	3
		Instructional Hours	**12**
Suggested Learning Methods : Visual Learning			
		Total Hours	**60**

Text Books	1. തിരക്കഥ - ഞാൻ പ്രകാശൻ - ശ്രീനിവാസൻ, ഡി.സി.ബുക്സ് 2. നാടകം - ഭരതവാക്യം
Reference Books	1. കഥയും തിരക്കഥയും ഡോ.ആർ.വി.എം.ദിവാകരൻ - എൻ. ബി. എസ് കോട്ടയം 2. മലയാള സിനിമയും സാഹിത്യവും - മധു ഇറവങ്കര - ഡി.സി.ബുക്സ് 3. ഒരു സിനിമ എങ്ങനെ ഉണ്ടാകുന്നു. - കെ.കെ. ചന്ദ്രൻ 4. നാടക സാഹിത്യ ചരിത്രം - ജി. ശങ്കരപ്പിള്ള - ഡി.സി.ബുക്സ് 5. നാടകം കലയും കാഴ്ചയും - പി.ജി.സദാനന്ദൻ - ഡി.സി.ബുക്സ്
Web. URLs	1. http://www.keralaculture.org>literature 2. http://www.manoramaonline.com

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	H	H	H	-	-	-	-	-	-	-
CO2	-	-	H	M	H	M	-	-	-	-	-	-	-
CO3	-	-	M	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	H	L	H	-	-	-	-	-	-	-
CO5	-	-	L	H	L	H	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. N. Rajani	Dr. Smitha C R

Course Code	Title		
23U1FRN404	Part – I : Le Francais General – IV		
Semester : IV	Credits : 3	CIA : 20 Marks	ESE : 55 Marks
(Common to all UG Programmes)			
Course Objective	Acquisition of standard French through French grammar and oral communication		
Course Category	Skill Development		
Development Needs	Global		
Course Description	Improved understanding and communication		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	learn pronouns, gérondif along with culture adaptation in foreign countries	Lectures /Tutorial	Assignment
CO 2	French food culture, manners, futur simple & futur proche.	Group Learning	Assignment
CO 3	Business and economic culture, la cause et la consequence.	Peer Teaching	Seminar
CO 4	Letter writing official and to a patron, le passif, les doubles pronoms	Group Learning	Group Project
CO 5	The city and country, urbanisation, l'opposition et la concession, le subjonctif et l'infinitif	Group Learning	Assignment

Offered by	Department of French

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	Explorer l'inconnu	1	1
		Instructional Hours	12
Suggested Learning Methods : Visuals			
II	Goûter l'insolite	1	2
		Instructional Hours	12
Suggested Learning Methods : Comprehensive writing			
III	Consommer autrement	1	3
		Instructional Hours	12
Suggested Learning Methods : Group discussions			
IV	S'engager pour une cause	1	4
		Instructional Hours	12
Suggested Learning Methods : Visuals			

V	Repenser le quotidien	1	5
		Instructional Hours	**12**
Suggested Learning Methods : Group Discussion			
		Total Hours	**60**
Text Books	1. Saison 2 Méthode de Français – Marie-Noëlle Cocton, Anouchka De Oliveira, Dorothée Dupleix (Unit 0 to 4)		
Reference Books	1. Connexions 2 Methode de Français Régine Mérieux , Yves Loiseau		
Web. URLs	1. www.academia.edu		

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	H	M	H	H	-	-	-	-	-	-	-
CO2	-	-	H	L	H	M	-	-	-	-	-	-	-
CO3	-	-	-	M	M	H	-	-	-	-	-	-	-
CO4	-	-	L	M	L	H	-	-	-	-	-	-	-
CO5	-	-	L	-	H	-	-	-	-	-	-	-	-

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Malathi	Dr. R. Malathi

Course Code	Title		
23U2ENG404	Part – II : Communicative English – II		
Semester : IV	Credits : 3	CIA : 20 Marks	ESE : 55 Marks

(Common to All UG Programmes)

Course Objective	To equip the students with Language Skills and develop interest in and appreciation of literature.
Course Category	Skill Development
Development Needs	Global
Course Description	SD: Helps to develop LSRW skill

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the values of life reflected in the prescribed prose	Lecture/Tutorial	Assignment
CO 2	Learn to interpret poem based on contextual evidence.	Lecture/Tutorial	Assignment
CO 3	Enhance imaginative and communication skills through short stories.	Lecture/Tutorial	Speaking
CO 4	Understand the performing art through drama.	Lecture/Tutorial	Reading
CO 5	Acquire proficiency in English for global competency.	Lecture/Tutorial	Writing

Offered by | **Department of English**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	**Prose** Francis Bacon – Of Adversity Dr. Radhakrishnan - Character is Destiny Sudha Murty - How I taught my grandmother to read	1	1
		Instructional Hours	**12**
Suggested Learning Methods : Intensive Reading			
II	**Poetry** Sarojini Naidu - The Soul's Prayer Emily Dickinson - Death in the Opposite House William Blake – London	1	2
		Instructional Hours	**12**
Suggested Learning Methods : Scaffolding Method			
III	**Short Stories** W. Somerset Maugham - Mr. Know-All Edgar Allan Poe-The Purloined Letter Ruskin Bond-The Thief Story	1	3
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			

IV	**Drama** William Shakespeare – As You Like It	1	4
		Instructional Hours	**12**
Suggested Learning Methods : Flipped Learning			
V	**GRAMMAR AND COMPOSITION** **Oral & Written Communication (Unit I–IV) Listening** – Comprehension practice from Poetry, Prose, Online Voice Practice, observing/viewing E-content (with subtitles), Guest/Invited Lectures, Conference/Seminar Presentations & Tests, and DD National News Live, BBC, CNN, VOA etc **Speaking** – In Group Discussion Forum, participate in the Turn Taking, and Conversation Management, Debating, Defending/Mock Viva- Voce, Seminar Presentations on Classroom-Assignments, and Peer-Team-interactions. **Reading**–Different Reading Strategies in Poetry, Prose, Novel, Newspaper etc **Writing** – Clauses – Conditional, Relative, Restrictive, Non-Restrictive, Denotation and Connotations Précis Writing, One word substitution.	1	5
		Instructional Hours	**12**
Suggested Learning Methods : Activity Based Learning			
		Total Hours	**60**

Text Books	Unit I – V: Compiled by the Department of English
Reference Books	CLIL (Content & Language Integrated Learning) – Module by TANSCHE NOTE: (Text: Prescribed chapters or pages will be given to the students by the department)
Web. URLs	

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Presentation	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	H	-	M	M	H	M	H	H	M	H	M
CO2	M	-	H	-	H	M	H	M	H	H	M	H	M
CO3	M	-	H	-	H	H	H	H	H	H	M	H	M
CO4	M	L	H	-	H	-	H	H	H	H	M	H	H
CO5	H	M	H	-	H	H	H	H	H	H	H	H	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Adappatu Ancy Antony	Dr. R. Malathi

Course Code	Title		
23U3MBC408	Core Paper VIII - Molecular Biology		
Semester: IV	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Familiarize students with basic fundamental knowledge and explore skills in molecular biology and become aware of the complexity and harmony of the cells.
Course Category	Skill Development
Development Needs	Global
Course Description	The course covers DNA, RNA and proteins and the molecular events that govern cell functions

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Describe the basic structure and biochemistry of nucleic acids discriminate between them.	Lecture	Assignment
CO 2	Overview the central dogma and identify the principles of DNA replication	Flipped Classroom	Seminar
CO 3	Discuss clearly about the organization and mechanisms of RNA	Video Lessons	Quiz
CO 4	Articulate applications of genetic code and mechanism of translation.	Tutorial	Seminar
CO 5	Outline in detail the explanation of Transcriptional Regulation with examples of lac operon and tryptophan operon in prokaryotic as well as eukaryotic organisms	Lecture / Case Studies	Seminar

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Primary structure of DNA**: Chemical and structural qualities of 3',5'-Phosphodiester bond. Secondary Structure of DNA: Watson & Crick model, Chargaff's rule, X–ray diffraction analysis of DNA, Forces stabilizes DNA structure, Conformational variants of double helical DNA, Hogsteen base pairing, Triple helix, Quadruple helix, Reversible denaturation and hyperchromic effect. Tertiary structure of DNA: DNA supercoiling	1	3
	Instructional Hours		**12**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Overview of Central dogma.** Organization of prokaryotic and eukaryotic chromosomes. DNA replication: Meselson & Stahl experiment, bi–directional DNA replication, Okazaki fragments. Overview of differences in prokaryotic and eukaryotic DNA replication.	1	6
	Instructional Hours		12
Suggested Learning Methods: Chart Preparation			
III	Structure and function of mRNA, rRNA and tRNA. Characteristics of promoter and enhancer sequences. RNA synthesis: Initiation, elongation and termination of RNA synthesis. Differences in prokaryotic and eukaryotic transcription. Basic concepts in RNA world: Ribozymes, RNA processing: 5'-	2	11

	Capping, Splicing-Alternative splicing, Poly 'A' tail addition and base modification		
		Instructional Hours	12
Suggested Learning Methods: Videos			
IV	**Introduction to Genetic code**: Elucidation of genetic code, Codon degeneracy, Wobble hypothesis and its importance, Prokaryotic and eukaryotic ribosomes. Steps in translation: Initiation, Elongation and termination of protein synthesis. Inhibitors of protein synthesis. Posttranslational modifications and its importance	1	9
		Instructional Hours	12
Suggested Learning Methods: You tube videos			
V	Organization of genes in prokaryotic and eukaryotic chromosomes, Hierarchical levels of gene regulation, Prokaryotic gene regulation –lac and trp operon, Regulation of gene expression with reference to λ phage life cycle.	1 2	11 12
		Instructional Hours	12
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**60**

Text Books	1. Friefelder, David. "Molecular Biology." Narosa Publications, 1999 2. Weaver, Robert F. "Molecular Biology" 2nd Edition, Tata McGraw-Hill, 2003. 3. Karp, Gerald "Cell and Molecular Biology: Concepts and Experiments" 4th Edition, John Wiley, 2005. 4. Friefelder, David and George M. Malacinski "Essentials of Molecular Biology" 2nd Edition, Panima Publishing, 1993.
Reference Books	1. Tropp, Burton E. "Molecular Biology: Genes to Proteins". 3rd Edition. Jones and Bartlett, 2008. 2. Glick, B.R. and J.J. Pasternak. "Molecular Biotechnology: Principles and Applications of Recombinant DNA" 4th Edition. ASM, 2010.
Web. URLs	https://microbenotes.com/category/molecular-biology/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	H	M	M	M	L	H	M	H	M	L	M	M	M
CO2	H	H	M	M	M	M	M	H	H	M	L	M	M
CO3	H	M	M	H	H	H	H	H	H	M	L	L	M
CO4	H	H	H	H	H	H	H	H	H	L	L	L	M
CO5	H	H	H	H	H	M	H	H	H	L	H	M	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Kasimani	Dr. M. Thangavel

Course Code	Title		
23U3MBC409	Core Paper IX – Techniques in Clinical Diagnosis		
Semester: IV	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Medical laboratory science professionals are vital healthcare detectives, competent in the collection, processing and analysis of biological specimens, the performance of lab procedures, the maintenance of instruments, and relating lab findings to common diseases/conditions that assist physicians in patient diagnosis and treatment, as well as in disease monitoring or prevention
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	The course combines lecture and laboratory practice, to allow students to demonstrate professionalism and interpersonal skills while achieving competence with common laboratory procedures. Students will be given the opportunity to demonstrate knowledge in making solutions, using aseptic techniques, and handing laboratory equipment.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Basic understanding about Human health and Diseases with knowledge about the various diagnosis.	Lecture / Chalk and talk	Assignment
CO 2	Comply with laboratory safety protocols by demonstrating proper technique	Lectures / Video Lessons	Seminar
CO 3	Demonstrate skill with the microscope, centrifuge, and other laboratory equipment	Lectures / Tutorial	Quiz
CO 4	Basic understanding of haematology, immunology	Lectures / Group Discussion	Seminar / Assignment
CO 5	Basic understanding of clinical chemistry with emphasis placed on point of care testing in all areas of the laboratory.	Lecture / Tutorial	Seminar

Offered by **Microbiology**

Course Content **Instructional Hours / Week: 3**

Unit	Description	Text Book	Chapters
I	Role of laboratory in Health care, delivery - Human health & Diseases, a) Types of diagnosis, b) Process of diagnosis. Laboratory at different levels. Duties & responsibility.	1	
		Instructional Hours	**09**
Suggested Learning Methods: Video lectures about the Importance of Human health.			
II	Laboratory organization - General principles, Components & Functions of laboratory, Staffing the laboratory, Job descriptions, Job Specifications and Work schedule.	2	6
		Instructional Hours	09
Suggested Learning Methods: Prepare a flow chart or diagrammatic representation on Functioning of laboratory.			

III	**Specimen handling** -General principles, Collection techniques and containers for specimen. Types of specimens, Specimen entry, Specimen transport, Specimen transfer and distribution & reassignment, Specimen Disposal, Specimen preservation.	3	
		Instructional Hours	09
Suggested Learning Methods: Practice for working with clinical specimens and acquire knowledge about instrumentation handling.			
IV	**Hematology & Immunology**- Blood Cells, While Blood Cell Morphology, Red Blood Cell Morphology, Laboratory Procedure: Identification of Blood Cells Under the Microscope, ABO & RH Blood Types of Laboratory Procedure: ABO/Rh Typing.	2	
		Instructional Hours	09
Suggested Learning Methods: Video lectures on the Blood and its cell components.			
V	**Basic Principles of Clinical Chemistry-** Clinically Significant Pathogen vs. Normal Flora, Glucose Metabolism and Regulation, Diseases Associated with Glucose Metabolism, Laboratory Procedure: Glucose and Cholesterol Analysis.	3	
		Instructional Hours	09
Suggested Learning Methods: Video lectures and group project			
		Total Hours	45

Text Books	1. Linne and Ringsrud. CLINICAL LABORATORY SCIENCE: Concepts, Procedures, and Clinical Applications 7th Edition. Elsevier. ISBN 978-0-323-22545-8 2. Jahan Singh Chuhan. Text book of Clinical Diagnostics and Treatment. Sumit Prakasan Publishers ISBN – 8187251042. 3. Haren Ram Chiary & H.S. Singh. The text Book of Medical Diagnostics. I K International Publishers. ISBN: 9789385909788.
Reference Books	**1.** William J. Marshall, Márta Lapsley , Andrew Day, Kate Shipman. Clinical Chemistry 9th Edition, Kindle Edition. 9th edition. ISBN: 978-0702079368.
Web. URLs	https://www.amazon.com/dp/B0892PV76F?tag=uuid10-20&asin=B0892PV76F&revisionId=fdf2b489&format=1&depth=1

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz/ Chart Preparation	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	M	M	L	H	H	H	M	H	H
CO2	M	M	M	H	M	M	H	H	H	H	H	M	H
CO3	H	H	H	M	H	M	M	M	H	M	H	H	H
CO4	H	H	M	M	H	M	M	H	H	H	H	H	M
CO5	M	H	H	H	H	H	H	M	H	M	M	H	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Dinesh M. D	Dr. M. Thangavel

Course Code	Title		
23U3MBP410	Core Paper X – Lab in Microbial Physiology, Environment, Agriculture and Molecular Biology		
Semester: III & IV	Credits: 4	CIA: 40 Marks	ESE: 60 Marks

Course Objective	To teach a variety of techniques used in physiology, Environment, Agriculture and Molecular Biology, while conducting discovery-based research.
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	Students will develop skills on biochemical test, isolation and separation of DNA and RNA. Analyse basic concept of mutation

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Outline the key concept of microbial physiology.	Lecture / Hands on	Performance
CO 2	Relate the knowledge on environment and its sampling techniques.	Lecture / Hands on	Observation
CO 3	Examine and quantification of microorganisms in soil.	Lecture / Hands on	Performance
CO 4	Apply knowledge on techniques in isolation of DNA.	Lecture / Hands on	Performance
CO 5	Analyse basic concept of mutation	Lecture / Hands on	Observation

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 5 & 5

Exp No	Experiments
	MICROBIAL PHYSIOLOGY
1.	Growth curve and determination of generation time in *E. coli* and yeast.
2.	Factors affecting growth - Temperature and pH
3.	Demonstration of the thermal death time and decimal reduction time of *E. coli*
4.	Microbial physiology of various bacteria - Biochemical test - Acid and gas production, Starch hydrolysis, Lipid hydrolysis, IMVIC test, Catalase test, H_2S production, Oxidase test and Urease test
	ENVIRONMENT
5.	Microbial sampling of air from various sources – indoor, outdoor and hospital environment.
6.	Analysis of water samples – Biological parameters: i). Determination of dissolved oxygen, ii) Determination of BOD, iii) Determination of COD.
7.	Water analysis by MPN technique – presumptive, confirmed and completed coliform test.
	AGRICULTURE
8.	Isolation of microorganisms from soil (bacteria and fungi).
9.	Isolation and identification of *Rhizobium* from root nodule of legumes.

10.	Isolation and identification of *Azospirillum* from soil sample.
11.	Isolation of blue green algae and their microscopic observation.
12.	Microscopic examination of VAM infection.
	MOLECULAR BIOLOGY
13.	Isolation of antibiotic resistance mutant by replica plating.
14.	Isolation of DNA from bacteria and yeast
15.	Electrophoretic separation of DNA
16.	Isolation of RNA
17.	Electrophoretic separation of RNA
	Total Hours **150 Hrs**

Text Books	1. James G. Cappuccino, Chad T. Welsh, **Microbiology: A Laboratory Manual**, Pearson Higher Education & Professional Group, 2017. 2. Stefan Surzycki, **Basic Techniques in Molecular Biology**, Springer, 2012. 3. Janice Speshock, **Microbiology Lab Manual**, Kendall Hunt Publishing Company, 2020.
Reference Books	1. Susan Carson, Sue Carson, Heather Miller. **Molecular Biology Techniques: A Classroom Laboratory Manual**, Elsevier, 2012. 2. Sue Carson, Heather B. Miller, Melissa C. Srougi**, Molecular Biology Techniques: A Classroom Laboratory Manual**, Academic Press, 4th edition, 2019.
Web. URLs	https://books.google.co.in/books/about/Molecular_Biology_Techniques.html?id=emvJWX-2t9kC&redir_esc=y

Tools for Assessment (40 Marks)

Laboratory Performance			Test - I	Test - II	Observation notebook	Total
Level of engagement in lab	Preparation	Result				
5	5	5	10	10	5	40

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	M	M	M	H	M	L	M	M	M
CO2	H	H	H	H	M	M	H	H	H	L	L	M	H
CO3	H	H	M	M	H	H	H	H	H	M	L	L	H
CO4	H	H	H	M	M	H	M	H	H	L	L	L	H
CO5	H	H	H	H	M	H	H	H	M	M	M	L	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

Course Code	Title		
23U3MTA404	Allied Paper – IV: Biostatistics		
Semester : IV	Credits: 3	CIA : 20 Marks	ESE: 55 Marks
Course Objective	This course introduces the basic Statistical concepts that are applied in Biosciences to enable the students to learn the Statistical measures and their applications.		
Course Category	Skill Development		
Development Needs	Global		
Course Description	It provides a overview of Statistical methods for analyzing corrected data produced by longitudinal measures take over time		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Describing the method of data collection and presentation	Group learning/ Lectures.	Assignment
CO 2	Memorizing different Measures of Central Tendency and Measures of Dispersion	Peer Teaching/ Lectures	Unit Test
CO 3	Distinguishing different Statistical situations using Sampling Techniques	Lectures/ Tutorial	Seminar
CO 4	Executing one way and two way analysis using Analysis of Variance	Group learning/ Lectures	Assignment
CO 5	Constructing the equation of a Trend Line using Regression analysis	Video Lectures/ Lectures	Quiz

Offered by Mathematics

Course Content **Instructional Hours / Week : 3**

Unit	Description	Text Book	Chapters
I	**Introduction to Biostatistics:** Definition – Application – Characteristics – Limitation – Data collection – Classification – Tabulation and frequency distribution.	1	1,2,4,6, 7,8
	Diagrammatic and Graphical Representation of data.		
	Instructional Hours		**9**
Suggested Learning Methods : Problem Solving Practice			
II	Measures of Central tendency: Mean Median and Mode	1	9
	Measures of dispersion**:** Range, Quartile Deviation – Standard deviation – Co-efficient of variation.		10
	Instructional Hours		**9**
Suggested Learning Methods : Seminar			
III	**Correlation:** Introduction – Types of correlation – Scatter diagram – Karl Pearson's co-efficient of Correlation – Coefficient of determination – Spearman's Rank Correlation.	1	12
	Regression Analysis - Regression Coefficients – Properties –Linear Regression.		13
	Instructional Hours		**9**
Suggested Learning Methods : Problem Solving Practice			
IV	**Sampling Techniques:** Introduction – Methods of Sampling – Sampling and Non–Sampling errors.		

	Hypothesis Tests: Standard Error – Tests of Significance based on Large samples, 't' and 'F'	1	20
		Instructional Hours	**9**
Suggested Learning Methods : Seminar			
V	**Test of Significance –** Chi Square Test **Analysis of Variance:** One way and Two way Classifications.	1 2	21 9
		Instructional Hours	**9**
Suggested Learning Methods : https://www.youtube.com/watch?v=ITf4vHhyGpc			
		Total Hours	**45**

Text Books	1. R.S.N. Pillai, V.Bagavathi, **Statistics Theory and Practice,** S.Chand & Sons 8th edition 2016 **Unit-1** - Chapter 1,2,4,6,7,8; Pg.No:15-18, 27-37,50-99, 100-122 **Unit-2** - Chapter 9,10;Pg.No: 124-170,180-193,244-250,259-273,279-282 **Unit-3** - Chapter 12,13; Pg.No: 396-411, 413-420, 425-430,465-525 **Unit-4** - Chapter 20 ; Pg.No: 810-846 **Unit-5** - Chapter 21; Pg.No: 847-870 2. Irfan Ali Khan and Atiya Khanum, **Fundamentals of Biostatistics**, Ukaaz publications, Second Revised Edition, 2004. **Unit-5** - Chapter 9 ; Pg.No: 344-353
Reference Books	1. Wayne W. Daniel, Chad L. cross, Biostatistics: **A Foundation for Analysis in health sciences**, John Wiley, 10th Edition, 2012. 2. Dr. P.N. Arora and Dr. P.K. Malhan, **Bio Statistics**, Himalaya Publishing House, Revised Edition, 2006
Web. URLs	1. https://youtu.be/AbHn39y8eUo 2. https://youtu.be/fNLeogEjMmM **3.** https://youtu.be/OXIpBKpOHxk

Tools for Assessment (20 Marks)

CIA I	CIA II	Model	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	M	H	M	M	L	M	H	M	M	L
CO2	M	H	M	M	M	H	M	H	M	M	H	M	H
CO3	L	H	M	M	M	M	L	H	M	M	M	L	H
CO4	H	H	H	M	H	H	M	M	M	H	H	M	M
CO5	H	H	H	M	H	M	M	L	M	H	M	M	L

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Ms. S. Ruth Kethsial	Dr. T. Chandrapuspham

Course Code	Title		
23U3CNR405	Allied Paper V – MS Office Practical		
Semester: IV	Credits: 2	CIA: 20 Marks	ESE: 30 Marks

Course Objective	To enable the students to learn and gain knowledge about MS Office
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	The course encompasses the essential skills for using word processing tool, working with spreadsheets, and able to know building databases along with preparing presentations.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the functions of Word, Excel and PowerPoint	Demonstration	Performance
CO 2	Apply bult in functions and formulas in excel	Demonstration	Observation
CO 3	Use chart representation for data	Demonstration	Performance
CO 4	Employ various test using Microsoft Excel	Demonstration	Performance
CO 5	Summarize the model of PowerPoint Presentation	Demonstration	Observation

Offered by	**Computer Science**

Course Content	Instructional Hours / Week: 2 & 2

Exp No	Experiments
1.	Create a MS-Word document to prepare your resume.
2.	Create a MS – Word Table to prepare student Mark list
3.	Calculate the Mean, Median and Mode for the given data using Microsoft Excel Worksheet.
4.	Find the range, Quartile deviation, Standard Deviation and Co-efficient of variance for the given data using Microsoft Excel Worksheet.
5.	Find Pearson product moment Correlation coefficient for the given data using Microsoft Excel Worksheet.
6.	Find T-test, F-test and Chi-square test for the given data using Microsoft Excel Worksheet.
7.	Create a MS-PowerPoint presentation to demonstrate Chart.
8.	Prepare a PowerPoint presentation. Presentation should contain 5 Slides with proper heading and content (use picture, Table and Charts)
	Total Hours **60**

Text Books	Chetan Srivastava, “Fundamentals of Information Technology”, Kalyani Publishers, New Delhi, Edition 2002.
Reference Books	Dinesh Maidasani, “Learning Computer Fundamentals, MS Office and Internet and Web Tech”, Firewall Media, 2005.
Web. URLs	https://support.microsoft.com/en-us/training

Tools for Assessment (20 Marks)

Application of Logic	E-Program Creativity	E-Program debugging	Test - I	Test - II	Observation notebook	Total
3	3	3	4	4	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H	H	M	H	-	-	-	-	M
CO2	M	M	M	M	H	M	H	M	-	-	-	-	L
CO3	H	H	M	H	M	M	M	H	-	-	-	-	M
CO4	M	H	L	M	H	H	H	M	-	-	-	-	L
CO5	M	M	H	H	M	H	M	H	-	-	-	-	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Mr. M. Senthil Kumar	Dr. N. Kavitha

Course Code	Title		
23U4MBS402	Skill Based Paper II – Biofertilizers and Biopesticides		
Semester: IV	Credits : 3	CIA: 20 Marks	ESE: 55 Marks

Course Objective	Students will impart knowledge on microorganisms as an alternative to synthetic fertilizers and pesticides to increase the soil fertility, disease and pest control in agriculture is gaining prominence.
Course Category	Skill Development
Development Needs	Global
Course Description	Learn about the benefits of microorganisms used as biofertilizers and biopesticides in the agricultural field to save the cost of production, increase the yield and methods involved in their production for environment sustainability.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Acquire knowledge on bacterial biofertilizers for sustainable agriculture.	Lecture	Assignment
CO 2	Demonstrate the use of cyanobacteria and Azolla in wetland crop improvement.	Flipped Classroom	Assignment
CO 3	Recognize the protagonist of mycorrhizae in crop improvement.	Video Lessons	Quiz
CO 4	Understand about the concepts in usage of bacteria as biopesticides and their mode of action.	Tutorial	Seminar
CO 5	Learn about the usage of viruses as biopesticides and their advantages.	Lecture / Case Studies	Seminar

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 3

Unit	Description	Text Book	Chapters
I	**Bacterial biofertilizers:** General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Isolation, characteristics, types, inoculum production and field application - *Rhizobium*, *Azotobacter*, *Azospirillum* and *Frankia*.	1	3
	Phosphate Solubilizers: Phosphate solubilizing microbes – Isolation, characterization, mechanism of phosphate solubilization, mass inoculum production, field application.	3	1, 2, 9 & 10
	Instructional Hours		9
Suggested Learning Methods: **Video lectures**			
II	**Algal biofertilizers:** Isolation, characteristics, types, inoculum production and field application of Cyanobacteria (Blue Green Algae) and Azolla: Azolla and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	2	11
	Instructional Hours		9
Suggested Learning Methods: Model and presentation			
III	**Fungal biofertilizers:** Mycorrhizae - Ecto and Endomycorrhiza. Concept of Mycorrhiza, VAM - Isolation, characteristics, preparation, mass production and field application.	2	3
	Instructional Hours		9

Suggested Learning Methods : Video lectures and demonstration			
IV	**Bacterial Biopesticides:** History and concept, definition, classification, concept, scope, production and field application - *Bacillus thuringiensis, Trichoderma viride*. Mechanism of action of BT toxin.	4	4 & 5
		Instructional Hours	9
Suggested Learning Methods : Model presentation and field visit			
V	**Viral Biopesticides:** Classification, characterization, production and field application - Baculovirus and Polyhedrosis Granulosis virus. Biosafety in usage of viral pesticides. Advantages of biopesticides over synthetic pesticides.	4	6 & 7
		Instructional Hours	9
Suggested Learning Methods : Field visit and Video lectures			
		Total Hours	**45**

Text Books	1. Panda H. **Manufacture of Biofertilizer and Organic Farming**. Asia Pacific Business Press Inc., Delhi, 2011. 2. Kaushik B.D., Deepak Kumar and Md. Shamim. **Biofertilizers and Biopesticides in Sustainable Agriculture**. Apple Academic Press. 2020. 3. Khan, M. S., A. Zaidi and J. Musarrat. **Phosphate Solubilizing Microorganisms.** Springer, Cham. 2014 4. Saleem, F. and A. R. Shakoori. **Development of Bioinsecticide**, Lap Lambert Academic Publishing GmbH KG, 2012.
Reference Books	1. Deshmukh, A. M., P. P. Dixit and R. M. Khobragade. **Handbook of Biofertilizers and Biopesticides**. Oxford Book Co., Jaipur, India, 2007. 2. Giri, B., Ram Prasad, Qiang-Sheng Wu and A. Varma. **Biofertilizers and Sustainable Agriculture**, Springer Nature Switzerland, 2019. 3. Aggarwal, S.K. **Advanced Environmental Biotechnology**, APH publication, 2005.
Web. URLs	https://vikaspedia.in/agriculture/agri-inputs/bio-inputs/bioinputs-for-nutrient-management/biofertilizers

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	L	H	H	H	H	H	M	M	H
CO2	H	M	M	H	M	M	M	M	H	L	L	L	H
CO3	H	M	H	H	M	M	M	H	H	H	M	M	H
CO4	H	H	H	H	M	M	H	H	H	H	L	M	H
CO5	H	H	H	H	L	M	H	H	H	L	M	L	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S Esath Natheer	Dr. M. Thangavel

Course Code	Title	
22U4NM4BT2	Part IV : Basic Tamil – II (அடிப்படைத்தமிழ் - II)	
Semester: IV	Credits: 2	CIA: 50 Marks

(Common to all UG Programmes)

Course Objective	அற இலக்கியங்களை அறிமுகப்படுத்தல்.
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)
Development Needs	**Regional (** தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்**)**
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	அற இலக்கிய அறிவு பெறுதல் - சிறுகதைகள் வழி சமூக அறிவு பெறுதல்.	விரிவுரை / காணொளி வகுப்பு	ஒப்படைவு
CO 2	தமிழ் எழுத்துக்கள் அறிமுகம் செய்தல் மற்றும் வாசித்தல் ஆகியவற்றின் பயன்பாடு.	குழு விவாதம்/ விரிவுரை	கருத்தரங்கு
CO 3	பிறமொழி அறிவுத் திறன் மேம்படச்செய்தல்.	விரிவுரை/காணொளி ப்பட விளக்கம்	ஒப்படைவு
CO 4	மொழிப்பெயர்ப்புத் திறன் மேம்படச்செய்தல்.	விரிவுரை/ குழு விவாதம்	குழுத்திட்டம்
CO 5	வார்த்தை அமைக்கும் திறன் பெறச்செய்தல்.	விரிவுரை / குழுத்திட்டம்	குழுத்திட்டம்

Offered by தமிழ்த்துறை

Course Content : Basic Tamil – II (அடிப்படைத்தமிழ் II) | **Instructional Hours / Week : 2 Hours**

Unit	Description	Text Book	Chapters
I	நீதி நூல்கள்	1.பாரதியார் ஆத்திச்சூடி 2.கொன்றைவேந்தன்	1.1 1 முதல் 12 வரிகள் 2.1 1 முதல் 7 வரிகள்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : நீதிநூல்களின் சிறப்பினை அறியும் பயன் பெற்றமை			
II	பதினெண் கீழ்க்கணக்கு நூல் (திருக்குறள்)	திருக்குறள்	2.1.கடவுள் வாழ்த்து -அகர முதல எனத் தொடங்கும்... அதி 1 குறள் -1 2.2. வான் சிறப்பு- நீரின்றி அமையாது உலகு. அதி-2.குறள் - 10 2.3. அன்புடைமை - அன்பின் வழியது உயிர்நிலை. அதி - 8.குறள் - 10 2.4. கல்வி - கண்ணுடையார் என்பர் . அதி-40 குறள்-393 2.5. இனியவை கூறல் - இனிய உளவாக இன்னாத அதி10. குறள் -10
		Instructional Hours	**6 Hours**
Suggested Learning Methods : திருக்குறளின் சிறப்பினை அறிந்தமை			
III	கிராமியக் கதைகள்	கிராமியக் கதைகள்	3.1.பரமார்த்தக்குரு கதைகள் 3.2.நாட்டுப்புறக் கதைகள் அறிமுகம்
		Instructional Hours	**6 Hours**
Suggested Learning Methods : கிராமியக் கதைகளின் கதை அமைப்பினை அறியும் வாய்ப்பு பெற்றமை			

IV	மொழிப்பயிற்சி	மொழிப்பயிற்சி	4.1. பிறமொழிச் சொற்களுக்கு தமிழ்ச்சொல் எழுதுதல்
Instructional Hours			**6 Hours**
Suggested Learning Methods :		தமிழ்ச்சொல் எழுதும் திறன் பெற்றமை	
V	எழுத்துப்பயிற்சி	எழுத்துப்பயிற்சி	5.1தன்விவரம் எழுதுதல் 5.2 பெயர், கல்லூரி விவரம் எழுதச்செய்தல்
Instructional Hours			**6 Hours**
Suggested Learning Methods : பிறமொழி கலப்பு இன்றி தமிழ்ச்சொல் எழுதும் திறன் பெற்றமை			
Total Hours			**30 Hours**

Text Books	1. இளங்கலை தமிழ் மாணவர்களுக்குரிய பாடநூல்“அரிச்சுவடி” 2. தொகுப்பு: தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.
Reference Books	1. ஔவையார் ஆத்திச்சூடி மணிவாசகர் பதிப்பகம், கோயம்புத்தூர் இராஜவீதி,01. 2. திருக்குறள் - பரிமேலழகர் உரை, மணிவாசகர் பதிப்பகம், சென்னை - 600018.
Web. URLs	https://youtu.be/d5be921uxhE, https://youtu.be/Wtg-GJPfXTM.

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Seminar	Assignment	Group Project	Total
8	8	10	8	8	8	50

Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	H	L	H	M	H	H					
CO2	L	L	H	L	M	M	L	H					
CO3	H	L	H	L	L	M	M	H					
CO4	H	L	M	L	L	M	H	M					
CO5	H	L	H	L	M	M	H	H					

H-High; M-Medium; L-Low

Course designed by	Verified by
Dr. S. Satheesh Kumar	Dr. A. Sridevi

Course Code	Title	
22U4NM4AT2	Part IV : Advanced Tamil – II (சிறப்புத்தமிழ் -II)	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	நூல்களின் வழி அறச் சிந்தனைகளை உருவாக்குதல் செம்மொழியினைச் செம்மைப்படுத்துதல்.
Course Category	Skill Development (மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்)
Development Needs	Regional (தமிழ் மொழியின் அவசியத்தை உணர்த்துதல்)
Course Description	மாணவர்களின் மொழித்திறனை ஊக்குவித்தல்

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	அறச்சிந்தனைகள் பெறுதல் மற்றும் இலக்கண வழக்கு முறைகளைப் பெறுதல்.	விரிவுரை/காணொளிப்பட விளக்கம்	கருத்தரங்கு
CO 2	கடிதம் எழுதுதல் மற்றும் மொழியறிவைப் பெறுதல்	விரிவுரை/ குழு விவாதம்	ஒப்படைவு
CO 3	படைப்பாக்கத்திறன் அறிவுபெறச்செய்தல்	விரிவுரை	கருத்தரங்கு
CO 4	தகவல் தொடர்பியலுக்கானகடிதம்,அமைவுத்திறன் பெறச்செய்தல்	விரிவுரை/ குழு விவாதம்	குழுத்திட்டம்
CO 5	மொழியைப் பிழையின்றிப் பேச,எழுதும் திறன் பெறச்செய்தல்	விரிவுரை/காணொளிப்பட விளக்கம்	ஒப்படைவு

Offered by தமிழ்த்துறை

Course Content : Advanced Tamil – II (சிறப்புத்தமிழ் -II) | **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	பதினெண் கீழ்க்கணக்கு நூல்கள்	1.திருக்குறள் 2.நாலடியார்	1.1. கூடாநட்பு 1.2. செய்நன்றியறிதல் - நாலடியார் 1.3. கல்வி (131,132 செய்யுள்கள்)
		Instructional Hours	**6**
Suggested Learning Methods : திருக்குறளின் சுவை அறியும் வாய்ப்பு பெற்றமை			
II	சிறுகதை	1.வெ.இறையன்பு - பூனாத்தி சிறுகதைகள்	2.1 சேவியர் வாத்தியார் 2.2 தூரிகை
		Instructional Hours	**6**
Suggested Learning Methods : சிறுகதைகளின் சுவை அறியும் வாய்ப்பு பெற்றமை			
III	இலக்கணம்	இலக்கணப் பயிற்சி ஏடு	3.1 எழுத்தும் சொல்லும் 3.2 சுட்டெழுத்துகள் 3.3 சொற்களைச் சரியாகப் பயன்படுத்தும் முறை 3.4 வினைச்சொற்கள், பெயர்ச்சொற்கள் 3.5 வினா எழுத்துகள்
		Instructional Hours	**6**
Suggested Learning Methods : இலக்கணப் பிழை இன்றி எழுதும் பயிற்சி பெற்றமை			
IV	வழக்கறிதல்	இலக்கணம்	மரபு வழக்கு - இயல்பு வழக்கு, தகுதி வழக்கு - அறிதல்
		Instructional Hours	**6**
Suggested Learning Methods : வழக்குகள் பற்றி முழுமையாக அறியும் பயிற்சி பெற்றமை			

V	படைப்பாற்றல் பயிற்சி	இலக்கிய வரலாறு	கவிதை–சிறுகதை–நூல் மதிப்பீடு எழுதுதல்
Instructional Hours			**6**
Suggested Learning Methods : மதிப்பீடு செய்யும் பயிற்சி பெற்றமை			
		Total Hours	**30 Hrs**
Text Books	1. இளங்கலைத்தமிழ் மாணவர்களுக்குரிய பாடநூல்"திரட்டு" தொகுப்பு: தமிழ்த்துறை, நேரு கலை மற்றும் அறிவியல் கல்லூரி, கோயம்புத்தூர்.		
Reference Books	1. திருக்குறள் –பரிமேலழகர் உரை, மணிவாசகர் பதிப்பகம், சென்னை - 018 2. வெ.இறையன்பு - பூனாத்தி சிறுகதைகள், விஜயா பதிப்பகம், கோவை.		
Web. URLs	https://youtu.be/_vB59q6At8s, https://youtu.be/aSvxO_rV9eQ.		

Course designed by	**Verified by**
Dr. S. Satheesh Kumar	**Dr. A. Sridevi**

Course Code	Title	
22U4NM4GEN	**Non Major Elective : General Awareness**	
Semester : IV	**Credits : 2**	**ESE : 50 Marks**

(Common to all UG Programmes)

Course Objective:

Enable the students to learn General knowledge and prepare for different competitive exams.

Course Outcomes:

CO1	Determine Verbal Aptitude, Numerical Aptitude and Logical Reasoning
CO2	Recall basic Science, history, Tamil, Computer, Commerce concepts which would help to crack competitive Examinations
CO3	Acquire time Management skills to attempt competitive Examinations
CO4	Develop Aptitude and problem-solving skills
CO5	Gain Knowledge about Current Affairs

Course Content **Instructional Hours / Week : 2**

S. No.	Topics
1.	Verbal Aptitude
2.	Numerical Aptitudeand Logical Reasoning
3.	Abstract Reasoning
4.	Tamil and Other Literature
5.	General Science and Technology
6.	Computer
7.	Economics and Commerce
8.	History and Freedom Struggle
9.	Sports
10.	Current Affairs
	Total Hours: 30

Text Book: "General Awareness", compiled by Nehru Arts and Science College, Coimbatore

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	-	-	H	-	-	L	-	-	-	-	-
CO2	H	L	-	-	H	-	-	L	-	-	-	-	-
CO3	H	L	-	-	H	-	-	L	-	-	-	-	-
CO4	H	L	-	-	H	-	-	L	-	-	-	-	-
CO5	H	L	-	-	H	-	-	L	-	-	-	-	-

H-High; M-Medium; L-Low

Course Designed by	Verified by HOD	Checked by	Approved by Chairman
Ms. P. Sheeba Maybell	Dr. T. Chandrapushpam		

VBOE

Value Based Open Elective

Course Code	Title	
22U4VBOE01	Value Based Open Elective Course : Design Ecosystem	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To gain the knowledge on ecosystem and environmental sustainability
Course Category	Crosscutting Issue : Environment And Sustainability
Development Needs	Global
Course Description	Design ecosystem describes about the components, types, structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment.

Course Outcomes		Teaching Methods
CO 1	Understand about the basic concepts of ecosystem and environmental planning	Lecture / Video Lessons
CO 2	Gain knowledge of challenges and design process of ecosystem	Lectures / Video Lessons
CO 3	Understand about functions and flow of energy in ecosystem	Case study / Model
CO 4	Analyse about process and mechanism of ecosystem control	Tutorial / Group Discussion
CO 5	Demonstrate about green infrastructure and regulatory framework	Lecture / Tutorial

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Sustainable Human Dominated-Ecosystem and Environmental planning:** Introduction to Ecology & environmental sciences; Principles and Scope of Ecology. Axioms of Ecological Engineering, Sustainable design principles, Global population dymanics, Human dominated earth.	1	1
		Instructional Hours	**6**
Suggested Learning Methods : Video Lectures			
II	**Designing Ecosystem services & Biomes:** Design challenges and needs, the design process, biomes, ecoregions, other land classification systems.	1	3 & 4
		Instructional Hours	**6**
Suggested Learning Methods : Video Tutorials			
III	**Energy and mass flow through ecosystem:** Structure and Functions of Ecosystems - Abiotic and Biotic components, Flow of energy and cycling of materials; water, carbon, nitrogen and phosphorus	3	2
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			

IV	**Ecosystem control:** Population control process, community control process. Stream restoration design - hydrology, sedimentology, geomorphology, habitat, riparian corridor and construction.	2	6
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
V	**Green infrastructure design:** Green infrastructure network, sustainable cities initiatives, agricultural sustainability indicators, surrounding environmental, ecological and social justice; environmental ethics, issues and possible solutions	3	4
		Instructional Hours	**6**
Suggested Learning Methods : Online Tutorial			
		Total Hours	**30**

Text Books	1. Matlock, M. D. and M. Robert. Ecological Engineering Design: Restoring and Conserving Ecosystem Services. JohnWiley & Sons, Inc. 2011. 2. Meffe, G.K., L. Nielson, R. L. Knight and D. Schenborn. Ecosystem Management: Adaptive, Community-Based Conservation. Island Press. 2012. 3. Elliot, D. 2003. Energy, Society and Environment, Technology for a Sustainable Future. Routledge Press.
Reference Books	1. Sim Van Der Ryn and S. Cowan. Ecological Design. Island Press, 1996. 2. Neeraja, N. Environment and Ecology: A Dymanic Approach, 3rd Edition. GKP Books Catalogue. 2018.
Web. URLs	1. https://www.nationalgeographic.org/encyclopedia/ecosystem/ 2. https://www.environmentandecology.com/

Course designed by	**Verified by Chairman**
Dr. S. Esath Natheer	Dr. M. Thangavel

Course Code	Title	
22U4VBOE02	Value Based Open Elective Course: Design Thinking	
Semester: IV	Credits : 2	ESE : 50 Marks

Course Objective	Inculcate the fundamental concepts of design thinking and develop the students as a good designer by imparting creativity and problem solving ability
Course Category	Crosscutting Issue : Professional Ethics
Development Needs	Local, National and Global
Course Description	The course aims to provideintroduction to the basic concepts and techniques of design thinking and methods of implementing design thinking in the real world.

Course Outcomes		Teaching Methods
CO 1	Learn the basic concepts of design thinking	Direct Instruction
CO 2	Develop the skill of applying the design thinking	Direct Instruction
CO 3	Learn the business uses of design thinking	Video Lessons
CO 4	Understand the variety of approaches within the design thinking discipline	Direct Instruction
CO 5	Impart knowledge in design thinking mindset	Direct Instruction

Course Content	Instructional Hours / Week: 2

Unit	Description	Text Book	Chapters
I	**Design Thinking Background** Definition of Design Thinking, Variety within the Design Thinking Discipline, Design Thinking Mindset	1	1
		Instructional Hours	**06**
Suggested Learning Methods: Brain Storming			
II	**Design Thinking Approach** Fundamental Concepts – Empathy, Ethnography, Divergent Thinking, Convergent Thinking, Visual Thinking, Assumption Testing, Prototyping, Time for Learning and Validation	1	5,1,3
		Instructional Hours	**06**
Suggested Learning Methods : Learning by Teaching			
III	**Design Thinking Resources** – People, place, material, organizational fit **Design Thinking Processes** - Numerous Approaches, Double Diamond Process, 5-Stage, School Process, Designing for Growth Process, Role of Project Management	1	5,6
		Instructional Hours	**06**
Suggested Learning Methods : DIY Activities			

IV	**Design Thinking in Practice I:** Process Stages of Designing for Growth - Design Thinking Tools and Methods – I- Purposeful Use of Tools and Alignment with Process, Visualization, Journey Mapping	1	6
		Instructional Hours	**06**
Suggested Learning Methods: Case Method			
V	**Design Thinking in Practice II:** Design Thinking Tools and Methods – II- Value Chain Analysis, Mind Mapping, Brainstorming, Concept Development, Assumption Testing, Rapid Prototyping, Customer Co-Creation, Learning Launch	2	8
		Instructional Hours	**06**
Suggested Learning Methods : Project Based Learning			
		Total Hours	**30**

Text Books	1. "Designing for growth: A design thinking tool kit for managers", by Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1 2. "The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems", by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1-119-46747-2
Reference Books	1. "Presumptive design: Design provocations for innovation", by Leo Frishberg and Charles Lambdin., 2016, ISBN: 978-0-12-803086-8 2. "Systems thinking: Managing chaos and complexity: A platform for designing business architecture.", "Chapter Seven: Design Thinking", by JamshidGharajedaghi, 2011, ISBN 978-0-12-385915-0
Web. URLs	1. https://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

Course designed by	**Verified by Chairman**
Ms. M. Nandhini	Dr. S. Jayapriya

Course Code	Title	
22U4VBOE03	Value Based Open Elective Course : Disaster Management	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To learn knowledge about disaster and risk and apply the same in the time of any disaster.
Course Category	Crosscutting Issue : Environment And Sustainability
Development Needs	National
Course Description	This course is designed to provide students with a comprehensive understanding of the concepts, theories, and practices of disaster and risk management. Students will learn how to identify and assess risks, develop emergency plans, and mitigate the impact of disasters on communities and organizations.

Course Outcomes		Teaching Methods
CO 1	Understand different types of disasters and their impact on individuals and communities.	Lecture/ Demonstration
CO 2	Analyze the disaster management scenario in India, the policy framework, and the role of different stakeholders in reducing disaster risk and building resilience	Lecture/ Case Studies
CO 3	Understand the concepts of risk and vulnerability in disaster management and analyze the different approaches to disaster risk reduction.	Lectures / Video Lessons
CO 4	Analyze the concept and nature of disaster preparedness, different components of a disaster preparedness plan	Tutorial / Case Studies
CO 5	Narrate the emergency responses to be taken by the national disaster management force and the practical training process on disaster management	Lecture / Class Projects

Course Content	**Instructional Hours / Week:2**

Unit	Description	Text Book	Chapters
I	**Introduction on Disaster** Definitions and Terminologies used in Disaster Management, Basic concepts in Disaster Management, Types of Disaster: Natural Disaster: Flood, Cyclone, Earthquakes, Landslides, epidemic or Pandemic etc. (Case studies of each), Man-made Disaster: Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc. (Case studies of each).	1	1
	Instructional Hours		**6**
Suggested Learning Methods : Power Point Presentation			
II	**Disaster management in India** Hazard and Vulnerability Profile India, Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, National Institute of Disaster Management, National Disaster Response Force (NDRF),	1	2

	National Disaster Management Authority, States Disaster Management Authority, District Disaster Management Authority and Cases Studies.		
		Instructional Hours	**6**
Suggested Learning Methods : PPT and Video Lecture			
III	**Risk and Vulnerability** Analysis Risk: Assessing Disaster Risk, Disaster Risk Reduction, Vulnerability: Its concept and analysis, Strategic Development for Vulnerability Reduction, Climate Variability & Disaster Risk, Industrial hazard and Risk Management	1	3
		Instructional Hours	**6**
Suggested Learning Methods : Video Lecture			
IV	**Disaster Preparedness** Concept and Nature, Disaster Preparedness Plan, Prediction, Early Warnings and Safety Measures of Disaster, Role of Information, Education, Communication, and Training, Role of Government, International and NGO Bodies.	1	4
		Instructional Hours	**6**
Suggested Learning Methods : PPT and Group Activity			
V	**Response and 3Rs** Emergency Response: Introduction, Crisis Response Plan (CRP), Communication, Participation, and Activation of Emergency Preparedness Plan, Search, Rescue, Evacuation and Logistic Management, Role of Government, International and NGO Bodies, Psychological relief and recovery, Relief operation and Recovery, Post Disaster Public Health Management, 3R - Rehabilitation, Reconstruction and Recovery, Reconstruction and Rehabilitation as a Means of Development, Damage Assessment, Post Disaster effects and Remedial Measures, Role of Educational Institutions in Disaster management.	1	5
		Instructional Hours	**6**
Suggested Learning Methods : Laboratory Practice			
		Total Hours	**30**

Text Books	1. Disaster and Risk Management (2023), Notes Compiled by the Department of Criminology, Nehru Arts and Science College, Coimbatore
Reference Books	1. J. P. Singhal, "Disaster Management", Laxmi Publications, 2003. 2. M C Gupta, "Manual on Natural Disaster Management in India", NIDM, New Delhi, 2013 3. R K Bhandani, "An Overview on Natural &Man-made Disasters and their Reduction", CSIR, New Delhi, 2000 4. Dr. Mrinalini Pandey, "Disaster Management", Wiley India Pvt. Ltd, 2014. 5. National Disaster Management Authority Publications-Guidelines & Templates for Disaster Management

Course designed by	**Verified by Chairman**
Dr. Reneesh K. Regan	Dr. Reneesh K. Regan

Course Code	Title	
22U4VBOE04	Value Based Open Elective Course : Environmental Pollution and Waste Management	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To acquire deeper knowledge about Environmental Management Systems
Course Category	Crosscutting Issue : Environment And Sustainability
Development Needs	Global
Course Description	Environmental Pollution and waste Management involves studying the management of any unnecessary resource use or release of substances into the water, land or air that could harm human health or the environment

Course Outcomes		Teaching Methods
CO 1	Understand the types of environmental pollutants	Lecture / Group Learning
CO 2	Describe, develop and interpret methods of the Environmental Management Systems.	Lecture/ Online Tutorial
CO 3	Critically evaluate methods and possibilities within Environmental Management Systems from asystems perspective.	Lecture/ Online Tutorial
CO 4	Understand the effective management of environmental pollutants	Lecture/ Online Tutorial
CO 5	Learn Environmental Auditing for various Industries/Projects.	Lecture/ Online Tutorial

Course Content	Instructional Hours / Week : 2

Unit	Description	Text Book	Chapters
I	Introduction to Environmental pollutants,Types of pollutants, Biodegradable pollutants, Non-biodegradable pollutants; Air pollution, Water Pollution, Soil Pollution	1	1,2
		Instructional Hours	**6**
Suggested Learning Methods: Industrial Visit			
II	Introduction to Environmental Management System basic definitions and terms, Framework for Environmental Management Systems, Approach for developing an Environmental Management System.	2	2, 4
		Instructional Hours	**6**
Suggested Learning Methods :Web search			
III	The introduction and implementation of ISO 14001: environmental policy, planning, implementation and operation, checking, management review. Applications EMS in terms of Process flow chart, effluent Generation, composition and treatment of effluents from following industries – sugar, pulp and paper, electroplating, dairy, oil refineries, etc.	2	5
		Instructional Hours	**6**
Suggested Learning Methods : Online tutorial			

IV	Introduction to Environmental Auditing, Category "A" & "B" types of projects. Procedures and Guidelines to conduct Environmental Audit. Plastic Pollution: Causes, impacts, and reduction strategies -Global issue of plastic pollution and innovative solutions	3	7
		Instructional Hours	**6**
Suggested Learning Methods : Online tutorial			
V	Municipal Solid Waste Management: Collection, transportation, and disposal of solid waste - Examination of waste treatment technologies and waste-to-energy processes. E-waste Management: Challenges and recycling techniques for electronic waste - Discussion on the environmental and health hazards associated with improper e-waste disposal.	1	8
		Instructional Hours	**6**
Suggested Learning Methods : Online tutorial			
		Total Hours	**30**

Text Books	1. ISO 14001 Certification - Environmental Management Systems: A Practical Guide for Preparing Effective Environmental Management Systems Textbook Binding – Import, 10 Aug 1995 by W. Lee Kuhre (Author) 2. M. N Rao, "Waste Water Treatment" Oxford and IBH publishing Co. Pvt Ltd, 2007 3. Peavy, H.S, D.R. Rowe &T.George, "Environmental Engineering", New York: McGraw Hill, 1987
Reference Books	1. Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999.
Web. URLs	1. https://www.anits.edu.in/online_tutorials/es/Unit%203.pdf

Course designed by	**Verified by Chairman**
Dr. O. S. Nimmi	Dr. N. Saranya

Course Code	Title	
22U4VB0E05	Value Based Open Elective Course : History of Ancient India	
Semester: IV	Credits: 02	ESE : 50 Marks

Course Objective	To explore the rich and diverse history of ancient India, examining its civilizations, political systems and cultural achievements.
Course Category	Employability
Development Needs	Global
Course Description	This course gives an in depth analysis of the Ancient Indian History marking the beginning of urban civilization in the Indian subcontinent.

Course Outcomes		Teaching Methods
CO 1	Understand the salient features of Indus valley civilization	Lecture
CO 2	Evaluate the features Civilizations	Tutorial
CO 3	Evaluate the rise of new movements	Lecture
CO 4	Visualize the administration of Mauryas and the art and architecture of Mauryas	Tutorial
CO 5	Identify the administration of Guptas and their contribution to University	Lecture

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	Definitions - Nature and Scope of History - History and Its Relationship with other Social Sciences - Geographical Features of India Sources of Indian History: Pre- History Paleolithic, Mesolithic, Neolithic, Chalcolithic and Megalithic Cultures.	1 &4	1-5
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
II	Indus Valley Civilization - Its Features & Decline; Early Vedic and Later Vedic Civilizations Vedic Literature Society Economy - Polity Religion.	2	2-4
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
III	Rise of New Religious Movements Charvakas, Lokayathas, Jainism and Buddhism; Mahajanapadas - Rise of Magadha; Impact.	3	3
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			

IV	Foundation of the Mauryan Dynasty; Ashoka and His Dharma Polity Administration - Society Economy Religion Literature - Art and Architecture; Disintegration of the Mauryan Empire; Post-Mauryan Kingdoms - Indo-Greeks - Kushanas and Kanishka - Society Economy Literature Art and Architecture; The Satavahanas; Sangam Age Literary Development.	4	4 &5
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
V	Gupta Empire: A Brief Political Survey - Polity and Administration, Social and Economic Conditions, Agriculture and Land Grants - Feudalism, Caste System, Position of Women, Education, Literature, Science and Technology, Art and Architecture - Harshavardana and His Achievements.	4	5
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
		Total Hours	**30**

Text Books	1. E.H. Carr, What is History? Penguin Books, England, 1990. 2. Majumdar, R.C., History and Culture of the Indian People, Vols. I, II & & III. 3. Romila Thapar, Asoka and the Decline of the Mauryas, OUP, New Delhi, 1995. 4. Romila Thapar, Early India (From the earliest to AD 1300).
Reference Books	1. Poonam Dalal : Ancient and Medival India for UPSC & State Level Exam

Course designed by	**Verified by Chairman**
Ms. S. Kavitha	Dr. R. Malathi

Course Code	Title	
22U4VBOE06	Value Based Open Elective Course : Indian Knowledge System	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To make the students understand the knowledge system in India and apply it to their day to day life
Course Category	Value Education
Development Needs	National
Course Description	This course will actively engage for spreading the rich heritage of our country and traditional knowledge in the field of Arts and literature, Agriculture, Basic Sciences, Engineering & Technology, Architecture, Management, Economics, etc

Course Outcomes		Teaching Methods
CO 1	Understand the History and an overview of Indian knowledge System.	Flipped Classroom
CO 2	Interpret the Importance of Vedic Corpus and Philosophical System	Student Centric
CO 3	Analyse the Foundational Concepts like Linguistics and and Number Systems.	Blended Mode
CO 4	Interpret the concepts of Astronomy and Town Planning Architecture.	Flipped Classroom
CO 5	Describe the Importance of Health, Wellness, Psychology and Administrative Governance	Case-Base

Course Content	Instructional Hours / Week : 2

Unit	Description	Text Book	Chapters
I	**Indian Knowledge System** : An Introduction: Importance of Ancient Knowledge-Defining Indian Knowledge System –The Indian Knowledge System Corpus-A Classification Framework-History of Indian Knowledge System.	1	1
	Instructional Hours		**06**
Suggested Learning Methods : Cooperative Learning			
II	**The Vedic Corpus**: Introduction to Vedas-The four Vedas. **Philosophical System**: Indian Philosophical System – Development and Unique Features-Vedic schools of Philosophy.	1	2 & 3
	Instructional Hours		**06**
Suggested Learning Methods : Peer Learning			

III	**Linguistics:** Component of a Language-Role of Sanskrit in Natural Language Processing. **Mathematics:** Unique Aspects of Indian Mathematics-Great Mathematicians and their Contributions-Arithmetic Calculations.	1	5 & 8
		Instructional Hours	**06**
Suggested Learning Methods : Group Learning			
IV	**Astronomy:** Unique aspects of Indian Astronomy-Historical Development of Astronomy in India-Elements of the Indian Calendar **Town Planning Architecture:** Indian Architecture- A Historical Perspective –Town Planning-Unitary Building –Temple Architecture	1	9 & 12
		Instructional Hours	**06**
Suggested Learning Methods : Mind Mapping			
V	**Health, Wellness and Psychology:** Ayurveda -Definition of Health-Tridosas-Relationships to Health-Disease-Disease Management-Yoga way of Life-Indian Approach to Psychology. **Governance and Public Administration:** Arthasastra Governance and Administration.	1	13 & 14
		Instructional Hours	**06**
Suggested Learning Methods : Case Studies			
		Total Hours	**30**

Text Books	1. B.Mahadevan,Vinayak Rajat Bhat,Nagendra Pavana R.N , Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Private Limited,Delhi, 2022.
Reference Books	1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002. 2. Traditional Knowledge System in India, by Amit Jha, 2009.
Web. URLs	1. https://www.youtube.com/watch?v=LZP1StpYEPM 2. http://nptel.ac.in/courses/121106003/

Course designed by	**Verified by**
Ms. N. Saranya	Dr. K. Raja Rajeswari

Course Code	Title	
22U4VBOE07	**Value Based Open Elective Course : Principles of Intellectual Property Rights**	
Semester: IV	**Credits: 2**	**ESE: 50 Marks**

Course Objective	To make the students to recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights. To learn the procedure of obtaining Patents, Copyrights, Trade Marks & Industrial Design
Course Category	Entrepreneurship
Development Needs	Global
Course Description	The course is designed to provide comprehensive knowledge to students regarding the general principles of IPR, Concepts and Theories, Criticisms of Intellectual Property Rights, the registration process, and the International Regime Relating to IPR.

Course Outcomes		Teaching Methods
CO 1	Understand Intellectual Property Rights (IPR), its significance in promoting innovation and creativity, and the different types of IPRs.	Lecture
CO 2	Equip with the knowledge to navigate the patent filing process effectively.	Tutorial
CO 3	Comprehend the fundamentals of copyrights, their types, registration procedures, terms and remedies	Lecture
CO 4	Narrate the trademarks, their rights, types, purpose, registration process, and the trademark landscape in India	Tutorial
CO 5	Analyze the significance of geographical indications (GI) and the need for their protection, the relevant laws and regulations in India	Lecture

Course Content	Instructional Hours / Week : 2

Unit	Description	Text Book	Chapters
I	**Introduction to Intellectual Property Rights (IPR):** Definition of IPR, Importance of IPR, Kinds of Intellectual property rights: Copy Rights, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge, IPR in India and the world, IPR and WTO.	1	1,2
		Instruction Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
II	**Patent:** Introduction to Patent, Patent Act 1970 and its amendments, Patentable and non-Patentable inventions, legal requirements for obtaining Patent, Registration Procedure of Patent, The role of Patentees and Different layers of the international patent system: National and International Patent filing procedures.	1	4
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
III	**Copyright**: Introduction to Copyrights, Origin, and Definition & Types of Copyrights, Registration procedure, Assignment & license, Terms of Copyright, Piracy, Infringement, Remedies, Copyrights with special reference to software, Copyrights in India.	1	
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			

IV	**Trademarks:** Introduction to trademarks, Rights of trademark, Types of trademark, purpose, and function of a trademark, trademark protection, and trademark registration process, trademarks in India.	1	9
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
V	**Design:** Introduction to Design, Registration of Design, Cancellation of Registration, International Convention on Design, functions of Design, **Geo Graphical Indication:** Introduction to Geo Graphical Indication, Why and how GI needs protection and GI laws, Indian GI act.	1	7,10
		Instructional Hours	**6**
Suggested Learning Methods : Lecture/Tutorial			
		Total Hours	**30**

Text Book	**1.** Intellectual Property Rights, Asha Vijay DurafeDhanashree K. Toradmalle, Wiley Publisher, 2022
Reference Book	1. B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
Web. URLs	1. https://dst.gov.in/sites/default/files/E-BOOK%20IPR.pdf

Course designed by	**Verified by Chairman**
Dr. K. Prathap Chandran	Dr. S. Saraswathi

Course Code	Title	
22U4VBOE08	Value Based Open Elective Course : Science, Society and Culture	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To create awareness on Science, Indian Society and cultural heritage of our Country
Course Category	Skill Development
Development Needs	Global
Course Description	Facilitate the awareness on Science in everyday life, Indian Society and Social empowerment, Democracy and Freedom of our Country. Ancient Civilization, cultural heritage and perceptions of Indian Culture

Course Outcomes		Teaching Methods
CO 1	Know the concepts of Science in our daily life and awareness about Scientific community	Lecture / Video Lessons / Model
CO 2	Gain knowledge on Indian society and development of modern society	Lecture / Video Lessons
CO 3	Learn about Indian social issues and awareness on our social laws	Lectures / Case study
CO 4	Understand the Indian culture, diversity of culture and Traditional customs	Tutorial / Group Discussion
CO 5	Comparison of ancient heritage and civilization of our country and follow them in our life	Lecture / Tutorial

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Common Science** - Developments and their applications- effects in day to day Life - Achievements of Indians in Science and Technology. Awareness in the fields of IT, Space, Computers, Robotics, Nanotechnology and Biotechnology. Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India. India's Policy in the Field of the Science, Policies and Reports related to Science-Innovative Technology Vision.	1	1
	Instructional Hours		**6**
Suggested Learning Methods : Video Lectures			
II	**Social Behaviour** - Salient features of our Society-Social diversity of India-Impact of globalization on Indian society. Social empowerment, Democracy and Freedom-Role of women and women's organization in the development of healthy society.	2	1
	Instructional Hours		**6**
Suggested Learning Methods : Video Tutorials			
III	**National Integration** – Communalism - Regionalism and Secularism – Problems relating to development and management of Social Sector-Services relating to Health, Education and Human Resources. Welfare schemes for vulnerable sections of the people-Performance of Centre and States schemes-Mechanisms-Laws,	2	1 & 2

	Institutions and Bodies constituted for the protection and development of vulnerable sections.		
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
IV	**South Asian Cultures**-Indian culture-combination of several cultures-Indian philosophy-Religious culture-Family structure and marriage-Wedding rituals-Indian greetings-Indian foods- Festivals-Traditional clothing. Epics of India-Indian Arts and Music-Indian architecture and Sculptures-Indian Languages and Literature-Perceptions of Indian culture.	3	1
		Instructional Hours	**6**
Suggested Learning Methods : Video Tutorials			
V	**Ancient Civilization**-Indus Valley Civilization-Harappa and Mohenjo-Daro civilization-Evolutions of early Buddhist Architecture-Advent in China-Ellora caves civilization-King Gupta's period of civilization-Vijayanagara inscriptions-Mohall's period of civilization-British culture.	4	2
		Instructional Hours	**6**
Suggested Learning Methods : Online Tutorial			
		Total Hours	**30**

Text Books	1. Science, Culture and Society: Understanding Science in the 21st Century by Mark Erickson, Paperback – Illustrated, 2015. 2. Khanna, Indian Social order and Laws, Universities Press. 3. Choudhary, Social Protection Law Provisions and Procedure. 4. Indian Heritage systems-Universal Law Publishing Company. 5. Ancient Civilization of Indian sub-continent- Ancient Books.
Reference Books	1. National integration and Secularism: Issues and Challenges, Regal Publications. 2. Ancient Culture of India: Issues and Concerns.
Web. URLs	1. https://www.amazon.in/Science-Culture-Society-Understanding-Century-dp-0745662250/dp/0745662250/ref=dp_ob_title_bk. 2. https://iasscore.in/upsc-syllabus/indian-society/indian-society-mains. 3. https://www.worldhistory.org/india/

Course designed by	**Verified by Chairman**
Dr. K. Narayanaswamy	Dr. M. Thangavel

Course Code	Title	
22U4VBOE09	Value Based Open Elective Course: Community Engagement	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	This course serves as an introduction to community engagement, helping learners to explore methods of community involvement, change making process, and professionalism within the community.
Course Category	Skill Development
Development Needs	National
Course Description	Apply the principles of communication for outreach to the diverse public, decision makers, and stakeholder groups.

Course Outcomes		Teaching Methods
CO 1	Apply professional behavior when working with community organizations	Lecture/ Case Study
CO 2	Investigate the complexity of problems related to community needs	Lecture/ Role Play
CO 3	Design and conduct the phases of a community engagement process, using consensus building and relating to formal planning procedures.	Lecture/ Case Study
CO 4	Recognize community interests, power dynamics, and conflict, and facilitate empowerment of excluded groups and negotiation	Lecture/ / Role Play
CO 5	Direct cross-jurisdictional, inter-agency, inter-disciplinary, and multi-stakeholder collaboration.	Lecture/ Case Study

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	Concept, Ethics and Spectrum of Community engagement, Local community, Rural culture and Practice of community engagement	3	2
		Instructional Hours	**6**
Suggested Learning Methods : Seminar			
II	Rural Development Programs and Rural institutions, Local Administration and Community Involvement	2	3
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			
III	Stages, Components and Principles of community development, Utility of public resources. Social contribution of community networking, Various government schemes.	1	3
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			

IV	Community Engaged Research and Ethics in Community Engaged Research. PRA, Programmes of community engagement and their evaluation.	1	2
		Instructional Hours	**6**
Suggested Learning Methods : Creative Art Assignments			
V	Rural Distress, Rural Poverty, Impact of Disasters on Migrant Laborers, Mitigation of Disaster.	2	1
		Instructional Hours	**6**
Suggested Learning Methods : Community Participation Program			
		Total Hours	**30**

Text Books	1. Participatory Rural Appraisal, PRA Application in Rural Development Planning, R Ramesh 2. Introduction to Community Development, Theory, Practice, and Service-Learning, Gary Paul Green, Jerry W. Robinson, Jr, 2011, SAGE Publications
Reference Books	1. Community-based participatory research: a capacity-building approach for policy advocacy aimed at eliminating health disparities. Am J Public Health. 2010 2. Achieving successful community engagement: A rapid realist review. BMC Health Services Research.
Web. URLs	1. https://unnatbharatabhiyan.gov.in › presentations 2. https://www.wellawareworld.org/

Course designed by	**Verified by Chairman**
Ms. T. D. Lidya	Dr. P. Nathiya

Course Code	Title	
22U4VBOE10	Value Based Open Elective Course : Emotional Intelligence	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To enable the Students to understand the concepts of Emotional Intelligence, its models and components
Course Category	Employability & Skill Development
Development Needs	National & Global
Course Description	Understanding the importance of Emotional Intelligence and build effective relationships

Course Outcomes		**Teaching Methods**
CO 1	Understand the Self-Awareness, Self-Management, Social Awareness and Relationship Management	Lecture/ Video Lectures
CO 2	Discover personal competence and techniques of building emotional intelligence.	Lecture/ Role Play
CO 3	Narrate the insights into establishing positive relationships	Lecture/ Peer Teaching
CO 4	Understand the emotional intelligence and its importance	Lecture/ Role Play
CO 5	Summarize the Self-Management Techniques	Lecture/ Group Discussion

Course Content	**Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Fundamentals of Emotional Intelligence**: Meaning Definition Nature and Significance Models of Emotional Intelligence-: Ability, Trait and Mixed Building blocks of emotional intelligence: Self-awareness, Self-Management, Social Awareness, and Relationship Management	1	1&2
	Instructional Hours		**6**
Suggested Learning Methods : Video lectures			
II	**Personal Competence:** Meaning Definition Self Awareness: Observing and recognizing one's own feelings, Knowing one's strengths and areas of development. Self-Management: Managing emotions, anxiety, fear, and anger.	1	5&6
	Instructional Hours		**6**
Suggested Learning Methods : Role Play			
III	**Social Competence**: Social Awareness: Others' Perspectives, Empathy and Compassion Relationship Management: Effective communication, Collaboration, Teamwork and Conflict Management	2	1&2
	Instructional Hours		**6**
Suggested Learning Methods : Peer Teaching			

IV	**Emotional Intelligence:** Measurement and Development - Meaning Definition, Importance Measures of emotional intelligence Strategies to develop and enhance Emotional Intelligence	2	4&5
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			
V	**Self-Management Techniques**: Meaning Definition Techniques to regulate emotions such as Mindfulness, Conditioned relaxation response and Boundary setting Techniques of Relationship Management: Display of empathy, Effective Communication , Teamwork , Conflict resolution	2	6&7
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
		Total Hours	**30**

Text Books	1. Bar-On, R., & Parker, J.D.A.(Eds.) (2000). The handbook of emotional intelligence. San Francisco, California: Jossey Bros. 2. Goleman, D. (2005). Emotional Intelligence. New York: Bantam Book. 3. Sternberg, R. J. (Ed.). (2000). Handbook of intelligence. Cambridge University Press.
Reference Books	1. HBR's 10 Must Reads on Emotional Intelligence (2015) 2. HBR's 10 Must Reads on Managing Yourself (2011) 3. Self-Discipline: Life Management, Kindle Edition, Daniel Johnson.

Course designed by	**Verified by Chairman**
Dr. N. Shani	Dr. N. Shani

Course Code	Title	
22U4VBOE11	Value Based Open Elective Course : Fundamentals of Tourism	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To impart Knowledge on Tourism and its development in the economic growth and also to identify the tourist needs.
Course Category	Employability
Development Needs	Global
Course Description	To enhance the students to get part in the tourism industry and to know about concepts of tourism.

Course Outcomes		Teaching Methods
CO 1	Understand tourism and its development	Direct Instruction
CO 2	Analyse the Factors influencing the Travel Motivations.	Direct Instruction
CO 3	Comprehend the Tourist Transport	Video Lessons
CO 4	Understand the Tourist Accommodations	Direct Instruction
CO 5	Apply the Travel Agency Operations	Video Lessons

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**The Tourism Phenomenon:** Definition – Tourism; Tour; Tourist; Visitor; Excursionist; Domestic; International; Inbound; Outbound; Destination. Growth of Tourism / Evolution / History of Tourism & Present status of tourism in India. Thomas Cook – Grand Circular Tour.	1	9, Key Terms
		Instructional Hours	**6**
Suggested Learning Methods : Lecture Based Learning			
II	**Travel Motivations:** ***Categories of Motivations:*** Physical Motivators, Cultural Motivators, Interpersonal Motivators, Status and prestige Motivators. ***Types of Tourism:*** Pleasure, relaxation, Rest and recreation, Health, Participation in Sports, Curiosity and Culture, Ethnic and Family, Spiritual and Religious, Professional or Business.	1	3
		Instructional Hours	**6**
Suggested Learning Methods : Group Learning Method			
III	**Tourist Transport:** Role of Transport in Tourism, Modes of Transport, Road Transport, Air Transport, Rail Transport, Sea Transport.	2	15
		Instructional Hours	**6**
Suggested Learning Methods : Group Learning Method			
IV	**Tourist Accommodation:** Definition, Types of Hotels, International Hotels, Resort Hotels, Commercial Hotels, Residential Hotels, Floating Hotels. **Supplementary Accommodation:** Motel, Youth Hostel, Camping Sites, Pension, Bed and Breakfast Establishment, Tourist Holiday Villages, Time and Resort Condominiums.	1	8
		Instructional Hours	**6**
Suggested Learning Methods: Group Learning Method			

V	**Travel Agency:** Products of Travel Agency, Classification of Travel Agency, Functions, Travel Related Business, International Travel Requirements, Travel Agency Operations.	3	2,3
		Instructional Hours	**6**
Suggested Learning Methods: Lecture Based Learning			
		Total Hours	**30**
Text Books	1. A.K. Bhatia, Tourism Development: Principles & Practices, Sterling Publishers Pvt 2007. 2. A.K. Bhatia, International Tourism Management, Sterling Publishers Pvt 2012. 3. Jagmohan Negi, Travel Agency Operations Concepts and Principles, Kanishka Publishers and Distributors, 2003.		
Reference Books	1. Biswanth Gosh, Tourism & travel management, Vikas Publishing House, Second Edition, 2008. 2. Christopher Holloway, Business of tourism, Elsevier Publisher, Second Edition, 2006.		

Course designed by	**Verified by Chairman**
Mr. B. Tamil Selvan	Mr. B. Tamil Selvan

Course Code	Title	
22U4VBOE12	Value Based Open Elective : Health Education	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	1. Acquire knowledge on different dimensions of health. 2. Inbuilt healthy life style practices
Course Category	Value education
Development Needs	Local
Course Description	It provides knowledge on values and practices for healthy living

Course Outcomes		Teaching Methods
CO 1	Recall the importance of health education	Interactive session
CO 2	Enlist the right choice of foods and dietary pattern	Interactive session
CO 3	Identify methods to manage mental health issues	Activity based teaching
CO 4	Practice effective personal health habits	Interactive session
CO 5	Summarize the importance of environmental health for mankind	Interactive session

Course Content — **Instructional Hours /Week : 2**

Unit	Description	Text Book	Chapters
I	**Health Education:** Concept of health, Components of wellness, spectrum and determinants of health - Definition of health-health education-Aim, objective and principles of health education - Health services, Related Activity -Measuring the health attitudes of students	1	1
		Instructional Hours	**6**
Suggested Learning Methods: Group Activity			
II	**Food and Health** Basic 4, 5and7 food groups; functional food groups-energy yielding, body building and protective foods (only sources and functions), food pyramid, meal planning pattern, healthy eating pattern.Related Activity -Assessing dietary adequacy of students	3,4	1 & 1, 2
		Instructional Hours	**6**
Suggested Learning Methods: Peer learning			
III	**Mental Health** Meaning of mental health – importance of mental health-characteristics of emotionally healthy-Self esteem-Values and patterns in decision making- Mental health problem of adolescences – depression & stress -causes and management Related activity-Stress level assessment in students	1	6
		Instructional Hours	**6**
Suggested Learning Methods: Role play			

IV	**Personal Health** Definition of personal health- under nutrition and over nutrition -prevalence of life style disease-healthy lifestyle practices- personal hygiene-Importance of physical activities & exercise Related Activity -Analyzing the physical activity pattern of students	1	8
		Instructional Hours	**6**
Suggested Learning Methods: Assignment			
V	**Environment and Health** Definition of environmental health, Biodiversity, climate change and biodiversity, environmental pollution-causes and consequences of air, water and soil pollution-Food contamination and consequences Related Activity-Group discussion on case studies	2	5,8
		Instructional Hours	**6**
Suggested Learning Methods: Group Discussion			
		Total hours	**30**

Text Books	1. Anspaugh (2001), Teaching Today's Health, Library of Congress Cataloging, 6th Edition, US 2. Tyler Miller (2006), Environmental Science, Cengage learning India private ltd 3. Srilakshmi (2010), Dietetics, New age International private limited, New Delhi 4. Srilakshmi (2010), Food Science, New age International private limited, New Delhi
Reference Books	1. Howley & Don Franus(B) (2003) Health Fitness Instructor's Handbook. Human Kinetics publication. 2. Ramachandran. L. Dharmalingam. T (1993) Health Education India. Vikas publishing House Private Limited
Journals	1. Health education

Course designed by	**Verified by Chairman**
Dr. A. Swarnalatha	Dr. A. Swarnalatha

Course Code	Title	
22U4VBOE13	Value Based Open Elective Course : Media and Politics	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To Impart knowledge of understanding the media and politics
Course Category	Skill Development
Development Needs	Global
Course Description	This course examines how media and political institutions interact to shape public thinking and debates around social problems.

	Course Outcomes	Teaching Methods
CO 1	Understand the basic idea of media and Politics	Lecture and Demonstration
CO 2	Summarize the political stance of media.	Lecture
CO 3	Apply the Skills on writing political news.	Lecture and Demonstration
CO 4	Evaluate the various characteristics of media Organization.	Video Lectures
CO 5	Apply the mass media influences as individuals, groups, and society in political contexts	Discussion

Course Content | **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	Media –- Meaning and importance. Role of media in Society Political Communication – Mass Media politics and Society- Cinema and political manifestation. Social media and Political narration	1	1
		Instructional Hours	**06**
Suggested Learning Methods : Learning by Teaching			
II	Characteristics of Modern Mass Media: Print and Electronic Media – Political economy and Ownership	2	2
		Instructional Hours	**06**
Suggested Learning Methods : Active Learning			
III	Political Economy - State ownership versus private ownership of mass media – Consequences of private and public- Media ownership pattern Government Regulation – Monopoly- Media content and its Censorship.	1	2
		Instructional Hours	**06**
Suggested Learning Methods : Group Learning			
IV	Public Opinion- The relationship between the mass media and public sphere- Political manipulation of media content- the impact of mass media on global political processes.	3	3
		Instructional Hours	**06**
Suggested Learning Methods : Visual Learning			

V	Political effects of Mass Media: Individual- group- and Society Public- making public opinion- Setting of Political agenda- Political Socialization- Political mobilization	2	4
		Instructional Hours	**06**
Suggested Learning Methods : Case study based Learning			
		Total Hours	**30**

Text Books	1. Lowe, L. (2016). The Definitive Guide to Creative Writing and Media Productions. United States: Xlibris UK. 2. Marshall, C. (2018). Writing for Social Media. United Kingdom: BCS Learning & Development Limited. 3. Cain, S., Batty, C. (2016). Media Writing: A Practical Introduction. United Kingdom: Palgrave Macmillan.
Reference Books	1. Mencher, Melvin."Basic News Writing" Universal Bookstall, New Delhi.1993. 2. Sreenivas Rao. Academic Book Centre, Ahmedabad. 1981. 3. Barnard, J. (2019). The Multimodal Writer: Creative Writing Across Genres and Media. United Kingdom: Bloomsbury Academic. 4. Kuehn, S. A., Lingwall, J. A. (2016). The Basics of Media Writing: A Strategic Approach. United States: SAGE Publications.
Web. URLs	1. https://www.bing.com/videos/

Course designed by	**Verified by Chairman**
Mr. R Baiju Paul	Mr. R. Baiju Paul

Course Code	Title	
22U4VBOE14	Value Based Open Elective : Positive Psychology and Work Life	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To bring an experience marked by predominance of positive emotions and informing them about emerging paradigm of Positive Psychology
Course Category	Skill Development
Development Needs	National
Course Description	Build relevant competencies for experiencing and sharing happiness as lived experience and its implications

Course Outcomes		Teaching Methods
CO 1	Understand the realities of Psychology and Work life	Lecture/ Case Study
CO 2	Insight on origin and development of Positive Psychology	Lecture/ Role Play
CO 3	Reveal the knowledge about phases of Positive Psychology	Lecture/ Case Study
CO 4	Perceptiveness about Happiness in Psychology and its Traits	Lecture/ Role Play
CO 5	Furnish the specific skills and techniques for working with Trust and Companionship	Lecture/ / Role Play

Course Content	Instructional Hours / Week : 2

Unit	Description	Text Book	Chapters
I	Introduction to Positive Psychology : Positive Psychology: Concept, History, Nature, Dimension and scope of Positive Psychology Seligman's PERMA	3	1
	Instructional Hours		**6**
Suggested Learning Methods : Seminar			
II	Positive Emotional States and Processes, Positive Emotions and well being: Hope & Optimism, Love, The Positive Psychology of Emotional Intelligence, Influence of Positive Emotions	2	3
	Instructional Hours		**6**
Suggested Learning Methods : Role Play			
III	Strengths and Virtues : Character Strengths and Virtues Resilience in the phase of challenge & Loss, Empathy and Altruism	1	3
	Instructional Hours		**6**
Suggested Learning Methods : Role Play			
IV	Happiness : Introduction to Psychology of happiness, well being and scope, Types of happiness- Eudaimonic and Hedonic History of Happiness, Theories, Measures and Positive correlates of happiness, Traits associated with Happiness, Setting Goals for Life and Happiness	3	2
	Instructional Hours		**6**
Suggested Learning Methods : Creative Art Assignments			

V	**Forgiveness and Gratitude** : Forgiveness and Gratitude , Personal transformation and Role of suffering , Trust and Compassion	1	3
		Instructional Hours	**6**
Suggested Learning Methods : Community Participation Program			
		Total Hours	**30**
Text Books	1. Argyle, M. 1987. *The psychology of happiness.* London: Methuen. 2. Carr, Alan (2007). Positive Psychology: The science of human happiness and human strengths. Routledge, Taylor and Francis Group-London. Csikzentmihalyi, Mihaly (1990) Flow: The Psychology of Optimal Experience, Harper Perennial. 3. Garcia,Hector., & Mirrales. Francesc.(2017) IKIGAI-The Japanese Secret to a Long and Happy Life, Hutchinson London.		
Reference Books	1. Frankl, Viktor E. (1988). The Will to Meaning: Foundations and Applications of Logotherapy. Meridian/Plume 2. Frankl, Viktor E. (2000) Man's Search for Ultimate Meaning, Basic Books. 3. Snyder, C. R., & Lopez, S. J., & Pedrotti, J. T (2011) Positive Psychology: The Scientific and Practical Explorations of Human Strengths, Sage Publications India Pvt Ltd.		

Course designed by	**Verified by Chairman**
Ms. K. Malini	Dr. P. Nathiya

Course Code	Title	
22U4VBOE15	Value Based Open Elective Course : Professional Ethics	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	Students will understand the importance of Values and Ethics in their personal lives and Professional careers
Course Category	Employability & Skill Development
Development Needs	National & Global
Course Description	Understanding the importance of maintaining Professional Ethics and build effective career.

Course Outcomes		**Teaching Methods**
CO 1	Understand the basic purpose of Profession	Lecture
CO 2	Summarize the Professional Rights And Responsibilities	Lecture/ Peer Teaching
CO 3	Apply the various Roles in Applying Ethical Principles at Various Professional Levels	Lecture/ Case Study
CO 4	Professional Ethical Values and Contemporary Issues	Lecture/ Role Play
CO 5	Excelling in Competitive and Challenging Environment to Contribute to Industrial Growth.	Lecture/ Group Discussion
Course Content		**Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Introduction to Professional Ethics: Meaning Definition Basic Concepts** Governing Ethics, Personal & Professional Ethics, Life Skills, Emotional Intelligence Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.	1	1&2
	Instructional Hours		**6**
Suggested Learning Methods : Video lectures			
II	**Basic Theories:** Basic Ethical Principles, Moral Developments, Deontology Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy	1	5&6
	Instructional Hours		**6**
Suggested Learning Methods : Mini Case Analysis			

III	**Professional Practices:** Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.	2	1&2
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
IV	Ethics in changing domains of Research: The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct The emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.	2	4&5
		Instructional Hours	**6**
Suggested Learning Methods : Role Play			
V	Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights	2	6&7
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
		Total Hours	**30**

Text Books	1. Professional Ethics: R. Subramanian, Oxford University Press, 2015. 2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press, 2015
Reference Books	1. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

Course designed by	**Verified by Chairman**
Dr. N. Shani	Dr. N. Shani

Course Code	Title	
22U4VBOE16	Value Based Open Elective Course : Science of Happiness	
Semester: IV	Credits: 2	ESE: 50 Marks

Course Objective	To explore the key elements of happiness at work and strategies to cultivate joy, well-being, and productivity in the workplace, relationship between happiness and various work-related factors, such as efficiency, creativity, innovation, work-life balance, and making a difference for others.
Course Category	Skill Development
Development Needs	Global
Course Description	To create a positive work environment and promote happiness for themselves and others.

Course Outcomes		Teaching Methods
CO 1	Understand the Happiness as a Scientific Construct	Lecture Method
CO 2	Apply the Theories and Models of Well-being	Flipped Teaching
CO 3	Demonstrate the Individual Factors and Happiness	Lecture Method
CO 4	Analyze the Social and Environmental Factors in Happiness	Lecture Method
CO 5	Apply Happiness and Work Efficiency	Flipped Teaching

Course Content — **Instructional Hours / Week : 2**

Unit	Description	Text Book	Chapters
I	**Introduction to Happiness as a Scientific Construct** Defining happiness and its importance in individual and societal well-being, Overview of subjective well-being and its components - life satisfaction, positive emotions, and negative emotions, Exploration of cultural variations in happiness and its measurement	1	1
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
II	**Theories and Models of Well-being** Prominent theories of well-being - hedonic well-being, eudemonic well-being, PERMA model. Role of factors - autonomy, meaning, and engagement in happiness. Strengths and limitations of different well-being models	1	2
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
III	**Individual Factors and Happiness** Personality traits - optimism, resilience and their influence on happiness. Role of genetics and biological factors in determining happiness levels. Examination of personal values, goals, and self-esteem and their impact on subjective well-being	1	3
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			

IV	**Social and Environmental Factors in Happiness** Importance of social relationships and social support in promoting happiness. Influence of social comparison, social norms, and cultural factors on well-being. Impact of environmental factors - access to nature, quality of living conditions on happiness.	1	4
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
V	**Happiness and Work Efficiency** Impact of happiness on work efficiency and productivity, strategies for managing daily hassles and reducing stress in the workplace, link between happiness and creativity in the workplace, Strategies for fostering a creative and innovative work environment	1	5
		Instructional Hours	**6**
Suggested Learning Methods : Group Discussion			
		Total Hours	**30**

Text Books	1. Susan A. David, IlonaBOni well, and Amanda Conley Ayers; The Oxford Hand book of Happiness.
Reference Books	1. Achor, S. (2010). The happiness advantage: The seven principles of positive psychology that fuel success and performance at work. Random House. 2. Lyubomirsky, S. (2008). The how of happiness: A scientific approach to getting the life you want. Penguin. 3. Diener, E., & Seligman, M. E. P. (2002). Very happy people. Psychological Science, 13(1), 81-84.
Web. URLs	1. https://onlinecourses.nptel.ac.in/noc23_hs06/preview

Course designed by	**Verified by Chairman**
Dr. S. Bajali	Dr. K. Raja Rajeshwari

SEMESTER V

Course Code	Title		
23U3MBC511	Core Paper XI – Immunology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To assimilate knowledge on host-microbial interactions
Course Category	Skill Development
Development Needs	Global
Course Description	The course describes on Microbiology on immune system, immunology and immunology related techniques

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Develop knowledge and awareness on Host defense mechanism and host-microbial interactions.	Lecture	Assignment
CO 2	Develop knowledge on Essential concepts of immune factors and the immune system	Flipped Classroom	Seminar
CO 3	Distinguish the different types of mechanisms and differences between primary and secondary responses and their relevance to immunizations	Video Lessons	Quiz
CO 4	Understand the production of Identify the role of antigen presenting cells, lymphocytes, and phagocytic cells in immune response	Tutorial	Seminar
CO 5	Use of Immunotechniques and its applications.	Lecture / Case Studies	Seminar

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapters
I	**History and Scope of Immunology:** Hematopoiesis - Formation of blood cells, Cells of immune system, Organs involved in immune system, Phagocytosis.	1	1,2
		Instructional Hours	**12**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Immunity and Types of immunity,** Antigen – Antibody – types Theories of antibody formation – instructive, selection theory and clonal selection theory Monoclonal antibodies and its applications (Hybridoma technology)	1,2	2,4
		Instructional Hours	12
Suggested Learning Methods: Chart Preparation			
III	**Allergy and Hypersensitivity,** Classification types and Mechanisms, Immunodeficiency diseases. Complement cascade system. Blood transfusion - ABO grouping - Rh factor	3	10,11
		Instructional Hours	12

Suggested Learning Methods: Videos			
IV	**Autoimmunity** Mechanisms and autoimmune response diseases: RA, SLE and Myasthenia Gravis. Transplantation, Tumour immunology Tissue transplantation, HLA typing - Mechanism of acceptance and rejection	4	15, 16
		Instructional Hours	12
Suggested Learning Methods: You tube videos			
V	**Antigen-Antibody Interactions-** Agglutination, Immunoelectrophoresis, Immunofluorescence techniques, Blotting technique.	1	3
		Instructional Hours	12
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**60**

Text Books	1.Annadurai B. A. Textbook of Immunology and Immunotechnology. S Chand &Co. Ltd., New Delhi. 1st Edition. 2008 2.Vaman Rao C. Immunology. Narosa Publishing House., New Delhi. 2nd Edition. 2008. 3.Arti Kapil. Ananthanarayan and Paniker's Text Book of Microbiology., Orient Blackswan Private Limited. 9th Edition. 2013. 4.Roitt I.M. Essentials of Immunology, Black Well Scientific Publishers, London. 1988.
Reference Books	1. 1.Kindt TJ, Goldsby RA, Osborne BA and Janis Kuby. Immunology. WHFreeman and Company, New York. 2007. 2. 2.Tizard I.R. Immunology: An Introduction. Saunders College Publishers, USA. 4th Edition 1995.
Web. URLs	1. https://www.frontiersin.org/journals/immunology 2. https://www.youtube.com/watch?v=rgphaHmAC_A

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO3	PSO4	PSO 5
CO1	H	L	L	M	L	L	M	L	L	M	L	L	M
CO2	L	M	L	L	L	M	L	M	L	M	L	L	M
CO3	L	L	M	M	L	M	L	M	H	H	M	L	L
CO4	M	L	L	M	L	L	M	L	H	M	H	M	L
CO5	L	M	L	L	L	M	L	L	M	L	H	M	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBC512	Core Paper XII – Medical Microbiology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Students gain knowledge about foundation in medical microbiology. Concepts in bacteriology, mycology and parasitology
Course Category	Employability/Skill
Development Needs	Global
Course Description	This course describes about the classification Infection, types of infection, Host-parasite relationship

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the Infection, types of infection, Host-parasite relationship and Micro flora of human body.	Lecture	Assignment
CO 2	Gain knowledge on nature of Antimicrobial agents	Lectures / Video lessons	Seminar
CO 3	Understand the different concepts of control agents for microorganisms.	Lectures / Video Lessons	Assignment/ Seminar
CO 4	Acquire knowledge on parasitology morphology and life cycle	Lectures / Video lessons	Quiz/Assign ment
CO 5	Learn the techniques to control the pathogenicity and laboratory diagnosis of fungi.	Lectures and Videos	Seminar

Offered by	**Microbiology**

Course Content	**Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapters
I	**Infection**: types of infection, sources of infection, reservoirs and vehicles of infection, predisposing factors. **Normal Micro flora of human body**: normal flora of skin, respiratory, gastrointestinal, genital tract, blood born infection and nosocomial infection..	1	9, 10
		Instructional Hours	**12**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Antimicrobial agents:** Histroy, Antibiotics, Antifungal and Antivirals (common drugs, their spectrum and mode of action). Methodologies for testing of antibacterial, antifungal (in vivo and in vitro infectivity models), mechanism drug resistance.	1	28
		Instructional Hours	12
Suggested Learning Methods: Chart Preparation			
III	**Bacteriology: Gram positive organisms** - Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of *Staphylococcus aureus, Streptococccus pyogenes, Bacillus anthracis, Mycobacterium tuberculosis.* **Gram negative organisms** -. *E. coli, Salmonella typhi, Vibrio cholerae, Pseudomonas aeruginosa, Neiserria gonorrhoeae*	2	22-41
		Instructional Hours	12
Suggested Learning Methods: Videos			

IV	**Parasitology:** Morphology, Life cycle, Pathogenicity and laboratory diagnosis of *Entamoeba histolytica, Trichomonas vaginalis, Plasmodium malariae, Taenia solium, Enterobius vermiculari, Ascaris lumbricoides* .	3	3-18
		Instructional Hours	12
Suggested Learning Methods: You tube videos			
V	**Mycology:** Morphology, Pathogenicity and laboratory diagnosis of *Candida albicans, Cryptococcus neoformans, Aspergillosis, Histoplasma capsulatum.*	4	8-15
		Instructional Hours	12
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**60**

Text Books	1.Brooks, G. F.,Jawetz, Melnick and Adelbergs Medical Microbiology. New York.: Graw-Hill Medical. 2.Paniker, C. K., and Ananthanarayan, Textbook of Microbiology. Himayatnagar, Hyderabad: Orient Longman. 2005. 3.Paniker, C. K., Textbook of Medical Parasitology. New Delhi: Jaypee Brothers
Reference Books	1. 1.Patricia, M.T. Bailey and Scott's Diagnostic Microbiology, 13th Edition, Mosby, Inc. Publishers, China. 2014. 2. 2.Patrick R. Murray, Ken. S. Rosenthal, George. S. Kobayashi, Michael A. Ptaller Medical Microbiology, 3rd Edition, C.V. Mosby Co. 1998.
Web. URLs	1. https://microbiologyinfo.com/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	H	H	M	H	H	H	H	H	H	H	L	L	M
CO2	H	H	M	H	H	M	M	M	H	M	L	L	H
CO3	H	H	L	M	H	H	M	H	H	H	H	M	L
CO4	H	H	L	H	H	H	M	H	H	M	H	M	M
CO5	H	H	M	M	H	H	H	M	M	M	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. M. Thangavel	Dr. M. Thangavel

Course Code	Title		
23U3MBC513	Core Paper XIII - Industrial Microbiology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To assimilate knowledge across industry and microbiology discipline
Course Category	Skill Development
Development Needs	Global
Course Description	The course describes the roles of microorganisms in producing different fermented products and preparation of specific media required for different fermentation processes

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Develop knowledge and awareness of the basic principles and concepts of fermentation.	Lecture	Assignment
CO 2	Interpret the screening of microorganisms and media used in industry.	Flipped Classroom	Seminar
CO 3	Distinguish the different types of fermentation processes used	Video Lessons	Quiz
CO 4	Understand the production of industrially important products.	Tutorial	Seminar
CO 5	Use research-based knowledge on downstream processing.	Lecture / Case Studies	Seminar

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapters
I	**History and Fermentor:** Introduction, Historical background, Fermentor - principle, types - design - mode of operation - instrumentation and control - sterilization of fermentor - aseptic inoculation method. Process flow sheeting.	1	1,2
		Instructional Hours	**12**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	**Industrially important microorganisms:** Screening methods for Industrial microbes, Media formulation, Strain Improvement, Prevention Techniques. Inoculum media and inoculum preparation.	1,2	2,4
		Instructional Hours	12
Suggested Learning Methods: Chart Preparation			
III	**Fermentation Process:** Submerged and Solid-state Fermentation. Batch, Continuous & Fed-Batch Fermentation. Immobilization of cell and enzymes.	2	10,11
		Instructional Hours	12
Suggested Learning Methods: Videos			
IV	**Microbial production of Industrial products:** Beverages, Vitamins - Riboflavin, cyanocobalamin. Enzymes (protease,	1	15, 16

	amylase). antibiotics (penicillin, streptomycin), Single cell protein (Baker's yeast, spirulina) Mushroom production – (Oyster and Button mushroom) Immobilization of cell and enzymes.		
		Instructional Hours	12
Suggested Learning Methods: You tube videos			
V	**Downstream processing**: Recovery and purification of fermentations products (intracellular and extracellular), cell disruption, precipitation, filtration, centrifugation, solvent recovery, chromatography, Ultra filtration and drying. Quality Assurance of Finished products.	1	3
		Instructional Hours	12
Suggested Learning Methods: Videos / Chart Preparation			
		Total Hours	**60**

Text Books	1. Casida LE Jr. **Industrial Microbiology**, 5th edition, Wiley Eastern Ltd., New Delhi. 1993. **2.** Stanbury, P.F., Whitaker, A. and Hall, S.J. **Principles of Fermentation Technology**, 2nd Edn. Pergamon Press, Oxford, 1999.
Reference Books	1. Crueger W and Crueger A. **Biotechnology: A Text Book of Industrial Microbiology**, 2nd edition. Panima Publishing Corporation, New Delhi. 2000. 2. Glazer NA and Nikaido H. **Microbial Biotechnology: Fundamentals of Applied Microbiology**. 2nd edition, Cambridge University Press. 2007. 3. Waites MJ, Morgan, NL, Rockey JS, and Higton G. **Industrial Microbiology: An Introduction**, Blackwell Science, London. 2001
Web. URLs	1. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boun dless)/17%3A_Industrial_Microbiology 2. http://www.lcwu.edu.pk/ocd/cfiles/Biotechnology/Maj/Biotech-402/IndustrialMicrobiology-An-Introduction-0632053070-Wiley_compressed.pdf 3. https://microbiologynotes.org/category/industrial-microbiology/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	H	L	L	M	L	L	M	L	L	M	L	L	M
CO2	L	M	L	L	L	M	L	M	L	M	L	L	M
CO3	L	L	M	M	L	M	L	M	H	H	M	L	L
CO4	M	L	L	M	L	L	M	L	H	M	H	M	L
CO5	L	M	L	L	L	M	L	L	M	L	H	M	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Kasimani	Dr. M. Thangavel

Course Code	Title		
23U3MBE501	Discipline Specific Elective Paper – I Group A - Microbial Biotechnology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To empower the students with knowledge on microbial products and give insight on fermentation process and their application in industrial microbial products production and applications.
Course Category	Employability and Skill Development
Development Needs	Global
Course Description	The students gain knowledge in the working of the fermenter and design of the fermenter and their applications in the production of enzymes and antibiotics.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the concepts of microbial fermentation technology.	Flipped classroom/Lectures	Assignment
CO 2	Describe about different types of fermentation and its uses.	Lectures / Video Lessons	Seminar
CO 3	Design and development the production of SCP production.	Lectures / Group Discussion	Quiz
CO 4	Interpret the process optimization, immobilization and scale up of fermentation process.	Lectures / Video Lessons	Seminar / Assignment
CO 5	Apply the knowledge of microbial biotechnology on product development	Lectures and Flipped classroom	Seminar

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapter
I	**Fermentation: An overview:** Brief history of fermentation – Fermentation: general concepts, Applications of fermentation; Range of fermentation process - Microbial biomass, enzymes, metabolites, Component parts of a fermentation process.	1	1-2
	Instructional Hours		**12**
Suggested Learning Methods : **Group learning**			
II	**Types of fermentations:** Aerobic and anaerobic fermentation, Submerged and solid state fermentation; Factors affecting submerged and solid state fermentation; Substrates used in SSF and its advantages; Culture media - types, components and formulations. Sterilization: Batch and continuous sterilization.	2	2-5
	Instructional Hours		**12**
Suggested Learning Methods : Quizzes			
III	**Production of single cell protein** from bacteria, fungi and algae: Characteristics, nutritional value and safety, substrates used, process examples, applications. Production and applications of microbial exopolysaccharides: Factors affecting fermentative production of exopolysaccharides	1	4
	Instructional Hours		12
Suggested Learning Methods: Group learning			

IV	**Process development:** Optimization of a process, Classical and statistical methods of optimization, Immobilization: different matrices, whole cell and enzyme immobilization; Scale up of bioprocess General concept of a fermenter: Batch, fed batch and continuous fermentation.	2, 3	2,1
		Instructional Hours	12
Suggested Learning Methods: Lectures			
V	Applications of Microbial Biotechnology: Microorganisms as source of novel compound production. Biopolymer and bioplastics, algal biotechnology, bioweapons, and bioshields. Microbes as biocontrol agents (Baculoviruses, *Beauveria bassiana*, *Bacillus thuringiensis*, *Bacillus sphaericus*, *Bacillus popilliae*).	1	13
		Instructional Hours	12
Suggested Learning Methods: Lectures			
		Total Hours	60

Text Books	1. Microbial Technology vol I and II by H.J. Peppler and D.Pearlman 2. .Uma Shankar Singh and Kiran Kapoor, Microbial Biotechnology, Oxford Book Company, 2010. 3.Stanbury, P.F., Whitaker and Hall, A.S.J., Principles of Fermentation Technology. Butterworth- Heinemann, 2016. 4.Vogel, H.C. Todaro, C.L. and Todaro C.C., Fermentation and Biochemical Engineering. Handbook: Principles, Process Design and Equipment. Noyes Publications, 3rd Edition, 2014.
Reference Books	1.Harzevilli, F.D. and H. Chen. Microbial Biotechnology: Progress and Trends. CRC Press, 2017. 2.Arnold L. Demain, Julian E. Davies, Richard H. Baltz. Manual of Industrial Microbiology and Biotechnology. American Society of Microbiology, 2010. 3.Yuan Kun Lee, Microbial Biotechnology: Principles and Applications, World Scientific, 2006.
Web. URLs	1. https://nptel.ac.in/courses/102/106/102106086/ 2. https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod7.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO 3	PS O4	PSO5
CO1	L	M	L	M	L	M	M	L	M	M	L	L	M
CO2	L	M	M	L	L	L	M	M	M	L	M	M	L
CO3	M	M	L	H	L	M	H	M	M	H	M	H	M
CO4	L	M	H	H	M	L	M	L	M	H	M	L	L
CO5	M	H	H	H	L	L	M	M	M	M	H	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. K. E. Vivekanandan	Dr. M. Thangavel

Course Code	Title		
23U3MBE502	Discipline Specific Elective – I – Group B - Soil Microbiology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	To understand the vital role, microbial process, applications and interaction of microorganisms in agriculture field and also in various hosts.
Course Category	Employability
Development Needs	Global
Course Description	Students will be able to explain the processes used by microorganisms for their replication, survival, interaction with their environment, hosts and host populations.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Gain knowledge on soil type and the factors that limit microbial growth in soil.	Lecture	Assignment
CO 2	Gain knowledge on microbial decomposition and bio-remediation processes.	Lecture / Demonstration	Seminar
CO 3	Gain knowledge on biogeochemical cycles, bio-fertilizers, and bio-Insecticides.	Lectures / Video Lessons	Quiz
CO 4	Compare the characters of pathogens affecting plants with example.	Tutorial / Videos	Seminar
CO 5	Gain practical knowledge about the important processes pertaining to soil and agricultural microbiology.	Lecture / Group Discussion	Quiz

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	Introduction to soil microbiology – properties of soil (structure, texture & formation). Types and significance of soil microbes– bacteria, fungi, algae, protozoa, nematodes, actinomycetes, viruses. Factors affecting microbial population. Rhizosphere and non-rhizosphere regions.	1	27
		Instructional Hours	**12**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	Microbial decomposition: Bioconversion of organic wastes – sugarcane waste - coir pith composting - Principles and Applications- conversion process. Anaerobic composting of sewage sludge.	3	11-12
		Instructional Hours	**12**
Suggested Learning Methods: Demonstration			
III	Biogeochemical cycle: Carbon, Phosphorus and Nitrogen. Biological nitrogen fixation – Symbiotic and non-symbiotic nitrogen fixer, Root nodule formation - Nitrogenase and Hydrogenase. Biofertilizer - *Rhizobium*, *Azotobacter*, Cyanobacteria, *Azolla*, VAM - Mass multiplication and crop response. Phosphate solubilizing bacteria. Biopesticide - Classification, mode of action - Bacterial insecticides	2	5

	(*Bacillus thuringiensis*) and Viral insecticides (NPV) and Fungal: *T. viride*, PGPR.		
		Instructional Hours	**12**
Suggested Learning Methods: Demonstration			
IV	Plant pathology: symptoms, characters of pathogens and control measures: Bacterial diseases - Citrus canker, Blight of rice. Fungal diseases – Red rot of sugarcane, Tikka leaf spot of ground nut. Viral diseases - TMV, Vein clearing disease of Bhendi (*Abelmoschus esculentus*).	2	8
		Instructional Hours	**12**
Suggested Learning Methods: Videos and Hands on training			
V	Enumeration of bacteria from rhizosphere and non-rhizosphere region. Cultivation of free-living and symbiotic N_2 fixing bacteria. Isolation of cellulose degrading organisms. Isolation of phosphate solubilizing bacteria.	1	19
		Instructional Hours	**12**
Suggested Learning Methods: Laboratory practice / You tube Videos			
		Total Hours	**60**

Text Books	1. Jeff Hardin, Gregory Paul Bertoni, Lewis J. Kleinsmith - **Becker's world of the cell**, Pearson Benjamin Cummings, 8th edition, 2012. 2. Verma P.S., Agarwal V.K., **Cell Biology, Genetics, Molecular Biology, Evolution and Ecology**, S. chand& Company Ltd., 2005. 3. James D. Watson, **Molecular Biology of the Gene**, Cold Spring Harbor Laboratory Press, 7th edition, 2013.
Reference Books	1. Janet Iwasa, Wallace Marshall, **Karp's Cell and Molecular Biology: Concepts and Experiments**, John Wiley & Sons, Inc., 8th edition, 2016. 2. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., **Molecular Biology of the Gene,** Cold Spring Harbour Lab. Press, Pearson Pub., 6th edition, 2008. 3. De Robertis, E.D.P. and De Robertis, E.M.F., **Cell and Molecular Biology**, Lippincott Williams and Wilkins, Philadelphia, 8th edition, 2006.
Web. URLs	http://www.nptel.ac.in/courses/102103015/pdf/mod3.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PS O5
CO1	L	M	L	M	L	L	L	L	M	L	M	L	M
CO2	H	M	L	M	L	L	L	M	L	M	M	L	M
CO3	H	M	L	H	L	M	L	L	M	L	L	M	L
CO4	M	H	L	H	L	M	M	L	L	M	M	L	M
CO5	H	M	L	H	L	L	L	M	H	M	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. P. Vinoth Kumar	Dr. M. Thangavel

Course Code	Title		
23U3MBE503	Discipline Specific Elective Paper I – Group C – Advances in Microbiology		
Semester: V	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Gain advanced knowledge on genomics, metagenomics, basis of host-microbe interaction in regulation of virulence factors and production of beneficial compounds by rDNA technology.
Course Category	Employability
Development Needs	Global
Course Description	Students can learn about the protein produced from the gene which is responsible for interaction among microorganisms and applications in rDNA technology.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand about the evolution of microorganisms and genetic organization.	Lecture / Video lessons	Assignment
CO 2	Learn about the isolation and characterization of functional genes on the basis of some specific condition.	Lecture / Flipped Classroom	Assignment
CO 3	Gain knowledge on molecular basis of host-microbe interaction and biofilm products.	Lecture / Video Lessons	Seminar
CO 4	Interpret the knowledge of systems and synthetic biology.	Lecture / Video Tutorial	Quiz
CO 5	Apply the knowledge on production of therapeutic components by using rDNA technology.	Lecture / Model presentation	Seminar / Model presentation

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Evolution of Microbial Genomes:** Salient features of sequenced microbial genomes, core genome pool, flexible genome pool and concept of pan genome, Horizontal gene transfer (HGT), Evolution of bacterial virulence - Genomic islands, Pathogenicity islands (PAI) and their characteristics.	1	9
	Instructional Hours		**12**
Suggested Learning Methods: Video lectures			
II	**Metagenomics:** Brief history and development of metagenomics, understanding bacterial diversity using metagenomics approach, Prospecting genes of biotechnological importance using metagenomics, Basic knowledge of viral metagenome, metatranscriptomics, metaproteomics and metabolomics.	2	11
	Instructional Hours		**12**
Suggested Learning Methods: Online tutorial			

III	**Molecular Basis of Host-Microbe Interactions:** Epiphytic fitness and its mechanism in plant pathogens, Hypersensitive response (HR) to plant pathogens and its mechanism, Type three secretion systems (TTSS) of plant and animal pathogens, **Biofilms:** types of microorganisms, molecular aspects and significance in environment, health care, virulence and antimicrobial resistance.	2	2
		Instructional Hours	**12**
Suggested Learning Methods: Model presentation			
IV	**Systems and Synthetic Biology:** Networking in biological systems, Quorum sensing in bacteria, Co-ordinated regulation of bacterial virulence factors, Basics of synthesis of polio virus in Laboratory, Future implications of synthetic biology with respect to bacteria and viruses.	1	12
		Instructional Hours	**12**
Suggested Learning Methods: Video lectures			
V	**Products of recombinant DNA technology**: Products of human therapeutic - insulin, hGH, antisense molecules. Bt transgenic – cotton and brinjal. Gene therapy, recombinant vaccines and protein engineering.	3	15-17
		Instructional Hours	**12**
Suggested Learning Methods: Model presentation and video lectures			
		Total Hours	**60**

Text Books	1. Fraser, C.M., T.D. Read and K.E. Nelson. Microbial Genomes, Humana Press, 2010. 2. Bull, A.T. Microbial Diversity and Bioprospecting, ASM Press, 2004. 3. Sangdun, C. Introduction to Systems Biology, Humana Press, 2008.
Reference Books	1. Klipp E, Liebermeister W. Systems Biology – A Textbook, Wiley –VCH Verlag, 2009. 2. Caetano-Anolles G. Evolutionary Genomics and Systems Biology, John Wiley and Sons, 2010. 3. Madigan MT, Martink JM, Dunlap PV and Clark DP. Brook's Biology of Microorganisms, 14th Edition, Pearson-Bejamin Cummings, 2014. 4. Wilson BA, Salyers AA Whitt DD and Winkler ME. Bacterial Pathogenesis- A molecular Approach, 3rd Edition, ASM Press, 2011.
Web. URLs	1. https://www.cs.cmu.edu/~sssykim/teaching/s13/slides/Lecture_metaG.pdf 2. https://facultystaff.richmond.edu/~lrunyenj/bio554/lectnotes/chapter14.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	H	M	M	H	H	M	L	L	H
CO2	H	H	H	M	M	H	M	H	H	H	L	L	M
CO3	H	M	M	H	H	M	M	M	M	M	L	L	M
CO4	M	M	H	H	M	H	M	H	H	M	M	M	L
CO5	H	H	M	H	H	H	H	H	H	M	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

Course Code	Title		
23U4MBS503	Skill Based Paper III – Management of Human Microbial Diseases		
Semester: V	Credits: 3	CIA :20 Marks	ESE:55 Marks

Course Objective	This course helps to Diagnosis of Human Microbial diseases
Course Category	Employability
Development Needs	Global
Course Description	Students will be able to explain the processes used by microorganisms for their role in infections, pathogenesis, including collection, quality control, quality assurance, safety, setup, identification, susceptibility testing, and reporting results.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Identify causes of human disease and mode of transmission	Lecture	Assignment
CO 2	Describe the concept of health, disease, Infection and pathogen.	Lecture / Demonstration	Seminar
CO 3	Disseminate knowledge on laboratory diagnosis of infections.	Lectures / Video Lessons	Seminar
CO 4	Understand Treatment using antibiotics.	Tutorial / Videos	Seminar
CO 5	Explicate General preventive measures.	Lecture / Group Discussion	Quiz

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week: 3**

Unit	Description	Text Book	Chapters
I	Human Diseases Caused by Bacteria and Virus - Airborne Diseases - Arthropod-Borne Diseases -Direct Contact Diseases - Food-Borne and Waterborne Diseases - Zoonotic Diseases - Opportunistic Diseases.	2	39
	Instructional Hours		**9**
Suggested Learning Methods: **Comics Preparation / You tube Videos**			
II	Human Diseases Caused by Fungi and Protists - Airborne Diseases - Arthropod-Borne Diseases -Direct Contact Diseases - Food-Borne and Waterborne Diseases - Zoonotic Diseases - Opportunistic Diseases.	2	40
	Instructional Hours		**09**
Suggested Learning Methods: Demonstration			
III	Diagnosis of Infectious Diseases – Laboratory Diagnosis of Bacterial, fungal, vial and Parasitic infections.	1	47
	Instructional Hours		**09**
Suggested Learning Methods: Demonstration			

IV	Treatment using antibiotics: Mode of action of antimicrobial drugs - Emergence of antibiotic resistance. Mechanism of action of Antiviral and Antifungal drugs.	2	9
		Instructional Hours	**09**
Suggested Learning Methods: Videos and Hands on training			
V	Epidemiology and control of infectious diseases - Types OF Epidemiological Studies - Transmission of Infectious Disease - Vaccine efficacy.	3	33
		Instructional Hours	**09**
Suggested Learning Methods: Laboratory practice / You tube Videos			
		Total Hours	**45**

Text Books	1. Brooks, G. F. Jawetz, Melnick and Adelbergs. **Medical Microbiology**. New York. McGraw-Hill Medical, 2007. 2. Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. **Prescott's Microbiology**. McGraw-HillPublications, 2014. 3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. **Mims' Medical Microbiology**. 4th edition. Elsevier, 2007.
Reference Books	1.Tille, P. M. **Bailey & Scotts Diagnostic Microbiology**. St. Louis, MO: Elsevier, 2017. **2.** Murray, P. R. **Basic Medical Microbiology**. Philadelphia: Elsevier, 2018.
Web. URLs	1. https://courses.lumenlearning.com/microbiology/chapter/mechanisms-of-antibacterial-drugs/ 2. https://www.msdmanuals.com/en-in/home/infections/diagnosis-of-infectious-disease/diagnosis-of-infectious-disease

Tools for Assessment (20 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
4	4	5	2	2	3	20

Mapping

CO \ PO	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	M	L	M	M	M	M	L	H	H	H	M	L	L
CO2	H	H	M	L	H	H	L	H	H	H	M	L	L
CO3	H	H	M	L	H	H	L	H	H	H	M	L	H
CO4	H	H	L	H	L	H	L	H	H	H	H	L	L
CO5	M	H	L	H	H	L	L	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Dinesh M. D	Dr. M. Thangavel

SEMESTER VI

Course Code	Title		
23U3MBC614	Core Paper XIV – Recombinant DNA Technology		
Semester: VI	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Students can acquire knowledge on the gene manipulation and tools used for construction of gene cloning. The students can understand and learn about the transformation techniques and recombinant product development.
Course Category	Employability
Development Needs	Global
Course Description	Understand about the components required for gene manipulation, transfer of specific DNA into target cell by using vectors and production of recombinant products.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Distinguish the milestones of genetic engineering and DNA modifying enzymes.	Lecture / Video lessons	Assignment
CO 2	Formulate the ideas on usage of cloning vectors.	Lecture / Flipped Classroom	Assignment
CO 3	Device methods for transformation of DNA.	Lecture / Video Lessons	Quiz
CO 4	Understand about the PCR, DNA sequencing and blotting techniques.	Lecture / Tutorial	Seminar
CO 5	Learn about various recombinant product development and their uses.	Lecture / Case Studies	Seminar / Model presentation

Offered by | **Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Gene Manipulation:** Definition and Applications. Milestones in genetic engineering and biotechnology. Restriction endonucleases, nomenclature, types, mode of action and its application.	1	3
	DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxy nucleotidyl transferase, kinases and phosphatases and DNA ligases.	3	4
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
II	**Cloning Vectors**: Definition and Properties. **Plasmid vectors**: pBR and pUC series. **Expression vector:** Bacteriophage lambda and M13 based vectors. **Yeast Vector:** Shuttle vector, cosmid vector & YAC.	4	6

	DNA library & screening: cDNA library, Cloning strategies, linkage adaption, homeopoitic system, screening of recombinants.	2	7
		Instructional Hours	12
Suggested Learning Methods: Video lecture and model presentation			
III	**Transformation of DNA:** Physical: biolistic method (gene gun), electroporation, microinjection. Chemical: liposome, PEG. Biological: Viral and *Agrobacterium* mediated delivery.	3	5
		Instructional Hours	12
Suggested Learning Methods: Online Tutorial			
IV	**PCR & DNA Sequencing:** Types, principles and application of PCR. Blotting techniques - Southern, Northern and Western. RAPD - Rapid Amplification of cDNA ends. DNA sequencing: Chain termination method, automated sequencing, pyro sequencing and shotgun sequencing.	2	8
		Instructional Hours	12 Hrs
Suggested Learning Methods: Project based learning			
V	**Products of recombinant DNA technology**: Products of human therapeutic - insulin, hGH, antisense molecules. Bt transgenic – cotton and brinjal. Gene therapy, recombinant vaccines and protein engineering.	3	15-17
		Instructional Hours	**12**
Suggested Learning Methods: Video lectures and group discussion			
		Total Hours	**60**

Text Books	1. Sandy B Primrose, Richard Twyman and Robert H Old. **Principles of Gene Manipulation,** Wiley-Blackwell Publications, 7th Edition, 2013. 2. David P. Clark and Nanette J. Pazdernik. **Molecular Biology**, Academic Press, 2013. 3. T. A. Brown, **Gene cloning and DNA Analysis – An Introduction**, Blackwell Publishing, 8th Edition. Blackwell Publishing Ltd., 2020. 4. J.W. Dale, M. Von Schantz and Plant, N. **From Genes to Genomes: Concepts and Applications of DNA Technology**. John Wiley & Sons. 2012.
Reference Books	1. A. Brown, **Genomes III**. 4thEdition, Garland Science Publishing, 2017. 2. Klug, Cummings, Spencer, Palladino, Killan, **Concepts of Genetics**, 12th Edition Pearson Education, Inc., 2018. 3. Leland H. Hartwell, Leroy Hood, Michael L. Goldberg Ann E. Reynolds, Lee M. Silver, **Genetics – From Genes to Genomes**, 4thEdition, McGraw-Hill, Publishing, 2016.
Web. URLs	1. https://genomebiology.biomedcentral.com/articles/10.1186/s13059-018-1586-y 2. https://www.slideshare.net/DeepakKumar2053/assignment-on-recombinant-dna-technology-and-gene-therapy

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	M	M	H	M	H	H	M	H	L	M
CO2	H	H	M	H	M	H	M	H	H	L	M	L	M
CO3	H	H	H	M	H	H	M	H	H	M	H	L	M
CO4	H	H	M	M	M	M	M	H	H	L	L	L	L
CO5	H	H	M	H	M	H	M	H	M	L	L	M	M
H-High; M-Medium; L-Low													

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

Course Code	Title		
23U3MBC615	Core Paper XV – Food and Dairy Microbiology		
Semester: VI	Credits: 4	CIA:25 Marks	ESE: 75 Marks

Course Objective	To understand and enable the students to isolate the microorganisms, methods of preservation of foods, Pasteurization, processing methods in the field of food and dairy microbiology
Course Category	Employability
Development Needs	Global
Course Description	The students gain knowledge to working in the food and dairy industry as a quality controller, manager and to learn how to test the sample, aseptic packaging and their preservation methods to increase the shelf life of the products.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the history of food microbiology and various parameters affecting microbial growth	Flipped classroom/Lectures	Assignment
CO 2	Gain knowledge on food preservation techniques.	Lectures / Video Lessons	Seminar
CO 3	Diagnose specific types of microbial spoilage during various food shelf-life stages in dairy field	Lectures / Group Discussion	Quiz
CO 4	Know about the use of microorganisms in food industries for public health benefits.	Lectures / Video Lessons	Seminar / Assignment
CO 5	Gain knowledge on various Enforcement and control Agencies for food products	Lectures and Flipped classroom	Seminar

Offered by | **Microbiology**

Course Content | **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapter
I	Microorganism involved in Food: Common Food borne Pathogen-Bacteria, Mold and Significance of microorganisms in Foods. Types of food: Fruits and fruit products, Vegetables and vegetable products. Parameters Affecting Microbial Growth: Intrinsic, Extrinsic.	2 3 2	1 5 3
	Instructional Hours		**12**
Suggested Learning Methods: **Group learning**			
II	Methods of food preservation. Use of high temperatures, freezing, ionizing Radiation, **Microwave processing and aseptic packaging.** Use of chemicals preservatives - organic acids, sulphur-dioxide, salts and high sugar concentration	1 1 3	5 6 4
	Instructional Hours		**12**
Suggested Learning Methods: Quizzes			
III	**Food borne diseases:** Staphylococcal, *E. coli*, Salmonellosis, shigellosis, Listerial infections. Food in toxification *Clostridium botulinum*, *Clostridium perfringens* Brucella association with food. Fungal toxins, Aflatoxins Alternaria Toxins, Toxigenic Phyto planktons and viruses.	3 3	7 8
	Instructional Hours		12
Suggested Learning Methods: Group learning			

IV	**Microbiology of Raw Milk:** Introduction, initial Microflora of raw milk, Total raw milk bacterial count- SPC method. **Microorganism present in raw milk:** Psychrotrophic microflora, Coliform bacteria **Fermented and Microbial Food:** Cheese, Yogurt (curd), Spoilage of food (Skimmed Milk, Canned food, Vegetables, fruits, fish, poultry product, meat and meat products). Aseptic packing of food. QC check of milk. Antimicrobial activity of Lactic acid bacteria	4 1 2 3 3	8 22 9 4 9
		Instructional Hours	12
Suggested Learning Methods: Lectures			
V	**Enforcement and control Agencies:** Food quality, food safety, food adulteration, international agencies, FDA, HACCP, FSSIA, Microbiological criteria for food, Protocols for CCP Deviations	1 3	11 11
		Instructional Hours	12
Suggested Learning Methods: Lectures			
		Total Hours	**60**

Text Books	1. Frazier. W.C and D.C Westhoff. (1978). Food Microbiology. 3rd Ed. Tata Macgraw Hill publishing Co., New Delhi. 2. Adams. M. R and M. D Moss. (1995). Food Microbiology. New Age International limited. 3. Adams. M. R and M. D Moss. Maurice O Mass (2008). Food Microbiology.3rded, RSC publishing International limited. 4. Richard Robinson.K,(2002) Dairy Microbiology Hand book 3rd edition by John Wiley and Sons, Inc., New York
Reference Books	1. Roday. S. (1998). Food Hygeine and Sanitation. Tata Mcgraw Hill Publications. 2. Pradeep Parihar and Leena Parihar.(2015). Dairy Microbiology Agrobios (INDIA). 3. Jay.J.M,, Loessener M.J and Golden. D. A. (2005). Modern Food Microbiology, Spinger
Web. URLs	http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/food_and_nutrition/02._food_safety_and_quality_control/21._international_and_national_food_regulatory_agencies/et/7359_et_et.Pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	H	L	M	L	L	M	M	L	L	M
CO2	M	H	L	M	L	L	L	L	L	M	H	L	M
CO3	M	M	L	H	M	L	M	L	L	M	L	M	L
CO4	L	H	L	M	L	M	L	L	M	M	L	L	M
CO5	H	M	M	L	L	M	L	M	L	M	H	M	L

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Dinesh M D	Dr. M. Thangavel

Course Code	Title		
23U3MBE604	Discipline Specific Elective Paper II – Group A – Biosafety and Intellectual Property Rights		
Semester: VI	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	This course helps to adhere to the ethical practices appropriate to the discipline at all times, adopt safe working practices relevant to the industries and in research field.
Course Category	Skill Development
Development Needs	Global
Course Description	To describe the biosafety regulations and ethical concepts in biotechnology. Understand the patent process and recognize the parts of a patent document and their significance

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Identify potential hazardous biological materials and the risks associated with them.	Lecture	Assignment
CO 2	Describe the biosafety regulations and ethical concepts in biotechnology.	Lecture	Assignment
CO 3	Disseminate knowledge on patents, patent regime in India and abroad.	Video Lessons	Quiz
CO 4	Understand the patent process and recognize the parts of a patent document and their significance.	Tutorial	Seminar
CO 5	Explicate patent agreements.	Lecture	Seminar

Offered by | **Microbiology**

Course Content	Instructional Hours / Week: 4

Unit	Description	Text Book	Chapters
I	**Biosafety:** Introduction; biosafety issues in biotechnology; Biological Safety Cabinets & their types; Primary Containment for Biohazards; Biosafety Levels of Specific Microorganisms	1	8
	Instructional Hours		12
Suggested Learning Methods : **Video lectures**			
II	**Biosafety Guidelines**: Biosafety guidelines and regulations (National and International); GMOs/LMOs- Concerns and Challenges; Role of Institutional Biosafety Committees (IBSC), RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs; Risk Analysis; Risk Assessment.	1	11&12
	Instructional Hours		12
Suggested Learning Methods: Model and presentation			
III	**Introduction to Intellectual Property**: Patents, Types, Trademarks, Copyright & Related Rights, Industrial Design and Rights, Traditional Knowledge, Geographical Indications- importance of IPR – patentable and non-patentables – patenting life – legal protection of biotechnological inventions – World Intellectual Property Rights Organization (WIPO).	2	1
	Instructional Hours		12
Suggested Learning Methods : Video lectures			

IV	**Grant of Patent and Patenting Authorities**: Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; An introduction to Patent Filing Procedures; Patent licensing and agreement; Patent infringement- meaning, scope, litigation, case studies, Rights and Duties of patent owner.	1	4,5
		Instructional Hours	12
Suggested Learning Methods: Group chart			
V	**Agreements and Treaties**: GATT, TRIPS Agreements; Role of Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty on international recognition of the deposit of microorganisms; Indian Patent Act 1970 & recent amendments	3	2
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
		Total Hours	**60**

Text Books	1. Goel D & Prashar S., **IPR, Biosafety and Bioethics**. Pearson, 2013. 2. Parashar, Shomini, **IPR, Biosafety & Bioethics**, 2013. 3. Sree Krishna V, **Bioethics and Biosafety in Biotechnology**, New age international Pvt., Ltd., Publishers, 1st Edition, 2007.
Reference Books	1. Bare Act, **Indian Patent Act 1970 Acts & Rules**, Universal Law Publishing Co. Pvt. Ltd., New Delhi, 2007 2. Kankanala C., **Genetic Patent Law & Strategy**, 1st Edition, Manupatra Information Solution Pvt. Ltd., New Delhi, 2007. 3. Mittal, D.P., **Indian Patents Law**, Taxmann, Allied Services (P) Ltd, 1999. Singh K K., (2015). **Biotechnology and Intellectual Property Rights: Legal and Social Implications**, Springer India, 2015. Senthil Kumar Sadhasivam and Mohammed Jaabir, M. S., **IPR, Biosafety and Biotechnology Management**. Jasen Publications, Tiruchirappalli, India, 2008
Web. URLs	https://ipindia.gov.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	M	L	L	L	M	M	H	L	M	L
CO2	L	M	L	L	L	H	M	L	L	L	M	H	M
CO3	L	H	L	M	L	L	H	L	L	M	L	M	M
CO4	M	H	L	M	L	L	M	M	M	M	L	L	M
CO5	L	M	M	H	M	M	H	L	L	M	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. Thulasi Sivaraman	Dr. M. Thangavel

Course Code	Title		
23U3MBE605	Discipline Specific Elective Paper II – Group B – Plant Pathology		
Semester: VI	Credits: 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	The objectives of the Plant Pathology are the study on: the living entities that cause diseases in plants; the non-living entities and environmental conditions that cause disorders in plants; the mechanisms by which the disease-causing agents that produce diseases; the interactions between the disease-causing agents.
Course Category	Employability
Development Needs	Global
Course Description	Learn about the biology and ecology of plant pathogenic organisms, plant disease epidemiology, evolution, phylogenetics and systematics of plant pathogens, defense mechanism in plants and plant disease management strategies.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand about the early development of plant diseases.	Lecture / Video lessons	Assignment
CO 2	Recognize the etiological agents of diseases.	Lecture /	Assignment
CO 3	Familiarize students with the basic plant disease spread and their control.	Lecture / Video Lessons	Seminar
CO 4	Gain knowledge on processes of infection and colonization of the host by the pathogens.	Lecture / Video Tutorial	Quiz
CO 5	Describe the aspects of integrated pest management and recognize the etiological agents of diseases.	Lecture / Model presentation	Seminar / Model presentation

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Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Introduction and history of plant pathology:** The herbalists, the systematics, beginning of the modern period, Doctrine of spontaneous generation, discovery of Bordeaux mixture, plant pathology in 20th century, genetics of the host and pathogen, environment in relation to plant disease, nature of disease resistant, biochemistry and physiology of diseased host plant, molecular biology of pathogenesis and induced systemic resistance, tissue culture in plant pathology, history and development of plant pathology in India.	2	2
		Instructional Hours	12

Suggested Learning Methods: Video lectures

II	**Pathogenesis:** Penetration and entry by plant pathogens, pre-penetration, entry through natural openings, direct penetration, entry through wounds, wounds caused by other fungus, wound caused by nematodes, entry through root hairs and buds, development inside host tissues.	2	3
	Important plant diseases giving emphasis on its etiological agent, symptoms, epidemiology and control measures - Important diseases caused by fungi White rust of crucifers *Albugo candida*, Downy mildew of onion – *Peronospora destructor*, Late lack stem rust of wheat – *Puccinia gram*inis f. Sp. *tritici*, Looses mut of wheat – *Ustilago nuda*. Wilt of tomato – *Fusarium oxysporum* f.sp. *lycopersici.* Important diseases caused by viruses: Papaya ring spot.	4	6-8
		Instructional Hours	12
Suggested Learning Methods: Online tutorial			
III	**Plant disease epidemiology:** Introduction, theories of epidemic development, development of disease in time, development of disease in space, fitting disease progress curves to epidemiological data, the role of the pathogen, sources of inoculum, vectors, the role of the host, host-plant distribution, the effect of host resistance on inoculums multiplication, the role of the environment, the soil, the atmosphere.	1	3
		Instructional Hours	12
Suggested Learning Methods: Model presentation			
IV	**Defense Mechanisms in Plants -** Concepts of constitutive defense mechanisms in plants, inducible structural defenses (histological cork layer, abscission layer, tyloses, gums), inducible biochemical defenses [hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, plant bodies, phenolics, quinones, oxidative bursts].	2	4-6
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
V	**Plant Disease Management:** Cultural practices for disease management - pathogen free propagation material, removal of infected plants, soil treatment, hygiene, crop rotation, fertilization, quarantine, chemical plant disease control - fungicides, biological control of plant diseases.	3	15-17
		Instructional Hours	12
Suggested Learning Methods: Model presentation and video lectures			
		Total Hours	60

Text Books	1. Richard N. Strange, **Introduction to Plant Pathology**, John Wiley & Sons Ltd., 2006. 2. Mehrotra, R.S., Ashok Aggarwal. **Fundamentals of Plant Pathology**, McGraw Hill Education India Pvt., Ltd., 2013. 3. Anne M.T., B. David, Collinge, A. Djurle., **Plant Pathology and Plant Diseases**,CAB international, 2020. 4. Sambamurthy, **Text Book of Plant Pathology**, 1st Edition, I.K. International Pvt., Ltd., 2010.
Reference Books	1. Christian, J.R. and Cumagun, **Plant Pathology**, Published by In Tech., 2012. 2. Singh, R.S. Introduction to Principles of Plant Pathology, 4th Edition, Oxford & IBH Publishing Co. Pvt. Ltd., 2009.
Web. URLs	1. http://ipm.ucanr.edu/PMG/diseases/diseaseslist.html 2. http://www.hillagric.ac.in/edu/coa/ppath/lect/plpath111/Lect.%207%20Pl%20Path%20111-%20%20DEFENCE%20IN%20PLANTS.pdf 3. file:///C:/Users/Admin/Downloads/Plant-Pathogens-Principles-of-Plant- Pathology.pdf

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	M	M	H	M	M	M	H	M	H	H
CO2	H	H	H	H	M	M	H	M	M	H	L	L	H
CO3	M	M	M	H	H	M	H	H	L	H	L	L	M
CO4	H	H	M	H	M	H	H	M	L	M	M	M	M
CO5	H	H	H	H	M	M	M	H	L	M	H	M	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBE606	**Discipline Specific Elective Paper II – Group C** **Microbial Quality Control in Food and Pharmaceutical Industries**		
Semester: VI	**Credits: 4**	**CIA: 25 Marks**	**ESE: 75 Marks**

Course Objective	This course impart skills to students in the area of Quality Control for food and pharmaceutical industries to ensure that their final products are consistent, safe, effective and predictable
Course Category	Skill Development
Development Needs	Global
Course Description	This course aims to introduce the essential elements of quality control and various aspects of microbiological quality control including Bioburden estimation, sterility testing, specific pathogens detection, environmental monitoring, personal hygiene monitoring, etc. with theoretical discussions and practical demonstrations

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Acquire knowledge about Good Laboratory Practices and biosafety.	Flipped classroom/Lectures	Assignment
CO 2	Gain an in-depth knowledge in Determining Microbes in Food**.**	Lectures / Video Lessons	Seminar
CO 3	Understand the concepts of determining Microbes in Pharmaceutical.	Lectures / Group Discussion	Quiz
CO 4	Acquire knowledge about Pathogenic Microorganisms.	Lectures / Video Lessons	Seminar / Assignment
CO 5	Outline the basic steps about Food Safety and Microbial Standards.	Lectures and Flipped classroom	Seminar

Offered by	Microbiology

Course Content	**Instructional Hours / Week: 4**

Unit	Description	Text Book	Chapter
I	**Microbiological Laboratory and Safe Practices:** Good laboratory practices, Good microbiological practices. Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3. Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration.	1	1
		Instructional Hours	**12**
Suggested Learning Methods : **Group learning**			
II	**Methods for Determining Microbes:** Culture and microscopic methods - Standard plate count, Most probable numbers, Biochemical and immunological. Concepts of food safety. Methods of preventing food contaminants.	1	4,5
		Instructional Hours	**12**
Suggested Learning Methods : Quizzes			
III	**Determining Microbes in Pharmaceutical:** Methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products. Concepts of quality management. Molecular methods - Nucleic acid probes, PCR based detection, biosensors.	1	6-9
		Instructional Hours	**12**
Suggested Learning Methods: Group learning			

IV	**Pathogenic Microorganisms of importance in Food & Water:** Detection of specific microorganisms - on XLD agar, Salmonella Shigella Agar, Manitol salt agar, EMB agar, MacConkey Agar, Saboraud Agar. Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (Resazurin assay).	2	6
		Instructional Hours	12
Suggested Learning Methods: Lectures			
V	**HACCP for Food Safety and Microbial Standards:** Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water. Application of quality assurance in food industry.	3	3
		Instructional Hours	12
Suggested Learning Methods: Lectures			
		Total Hours	60

Text Books	1. Baird RM, Hodges NA and Denyer SP. **Handbook of Microbiological Quality Control in Pharmaceutical and Medical Devices**, Taylor and Francis Inc., 2005. 2. Cangliang Shen and Yifan Zhang, **Food Microbiology Laboratory for the Food Science Student: A Practical Approach**, Springer Publications, 2017. 3. Martin Cole, **A simplified guide to understanding and using Food Safety Objectives and Performance Objectives**, International Commission on Microbiological Specifications for Foods (ICMSF), 2002.
Reference Books	1. Jay JM, Loessner MJ, Golden DA. **Modern Food Microbiology**, 7th Edition, Springer, 2005. 2. Garg N, Garg KL and Mukerji KG. **Laboratory Manual of Food Microbiology**, IK International Publishing House Pvt. Ltd., 2010.
Web. URLs	1. https://www.biologydiscussion.com/food-microbiology/microbiological-quality-control-of-food-microbiology/59564

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO 3	PS O4	PSO5
CO1	H	H	L	L	H	L	H	L	L	H	L	L	M
CO2	H	L	H	M	L	L	M	H	M	L	M	M	L
CO3	H	L	L	M	H	H	H	L	M	H	M	H	M
CO4	H	L	H	M	H	H	M	H	M	H	M	L	L
CO5	H	M	H	H	H	M	L	H	H	H	H	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. R. Kasimani	Dr. M. Thangavel

Course Code	Title		
23U3MBE607	Discipline Specific Elective Paper III- Group A – Nanobiotechnology		
Semester: VI	Credits: 4	CIA: 2 5 Marks	ESE: 7 5 Marks

Course Objective	The course focuses on the insight of the fundamentals of nanotechnology in biological and biomedical research. The course also gives the knowledge on how the nanomaterials are employed in analytical and medicinal rationales.
Course Category	Employability and Skill Development
Development Needs	Global
Course Description	Nanotechnology is an interdisciplinary field and attracts students from various disciplines. This course provides basic overview of nanomaterials and their applications. This course begins with a review of various types of nanomaterials and an introduction to general terminologies.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basics of Biotechnology- Nano sized structures.	Flipped classroom/Lectures	Quiz
CO 2	Explain the interaction between biomolecules and nanoparticle surface and its applications.	Lectures / Video Lessons	Seminar
CO 3	Optimize the synthesis of Biocompatibility of Nanomaterials	Lectures / Group Discussion	Assignment
CO 4	Analyze different types of DNA based Nanostructures	Lectures / Video Lessons	Seminar / Assignment
CO 5	Identify drug delivery system and mechanism of drug delivery using nanoparticles.	Lectures and Flipped classroom	Seminar

Offered by **Microbiology**

Course Content **Instructional Hours / Week :4**

Unit	Description	Text Book	Chapters
I	Introduction to the science of nano as nanobiotechnology Development of nanobiotechnology - timelines and progress, overview. Basics of biology - cell, organelles and nucleic acids as genetic material. Bio macromolecules - Carbohydrates, lipids, proteins, and Nucleic acids.	**5, 2**	**1,2**
		Instructional Hours	**12**
Suggested Learning Methods: **Group learning**			
II	Nanomaterial in biotechnology - nanoparticles, quantum dots, nanotubes and nanowires. Biosensors; different classes -molecular recognition elements, transducing elements.	3	22
		Instructional Hours	12
Suggested Learning Methods: Group learning			
III	Applications of molecular recognition elements in nanosensing of different analytes. Application of various transducing elements as part of nanobiosensors. Miniaturized devices in nanobiotechnology - types and applications, lab on a chip concept.	2	19, 20
		Instructional Hours	12
Suggested Learning Methods: Video lectures			

IV	Biological nanoparticles production - plants and microbial. Nanobiotechnological applications in health and disease - infectious and chronic. Nanobiotechnological applications in Environment and food - detection and mitigation	4	14
		Instructional Hours	12
Suggested Learning Methods: Lectures and Animations			
V	Drug Nanoparticles- Structure and Preparation, Liposomes, Characterization- Nanoparticles for crossing biological membranes. Fundamentals- Physicochemical Principles of Nanosized Drug Delivery Systems-Nanotubes, Nanorods, Nanofibers, and Fullerenes for Nanoscale Drug Delivery, Carbon nanotubes biocompatibility and drug delivery	2	24
		Instructional Hours	12
Suggested Learning Methods: Lectures			
		Total Hours	60

Text Books	1. Jain K.K, Nanobiotechnology in Molecular Diagnostics –Current Techniques and Applications, Taylor and Francis Publications 2006. 2. P. Boisseau, P. Houdy, M. Lahmani Nanoscience Nanobiotechnology and Nanobiology, springer press, 2007 3. Nanobiotechnology: Concepts, Applications and Perspectives (2004), Christof M. Niemeyer (Editor), Chad A. Mirkin (Editor), Wiley VCH. 4.Nanobiotechnology - II more concepts and applications. (2007) - Chad A Mirkin and Christof M. Niemeyer (Eds), Wiley VCH. 5.Nanotechnology in Biology and Medicine: Methods, Devices, and Applications
Reference Books	1. Textbook of Nanoscience and Nanotechnology B.S. Murthy, P. Shankar, Baldev Raj, B B Rath, James Murday Springer press, 2013
Web. URLs	1. https://www.nanowerk.com/nanobiotechnology.php 2. https://ocw.snu.ac.kr/sites/default/files/NOTE/8751.pdf 3. https://jnanobiotechnology.biomedcentral.com/articles/10.1186/1477-3155-10-31.

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	H	H	L	L	L	L	M	M	L	H
CO2	L	L	L	H	H	L	L	M	L	M	L	L	H
CO3	L	L	L	H	H	L	L	M	L	M	M	M	M
CO4	L	L	L	H	H	L	L	M	H	M	M	L	H
CO5	L	L	L	H	M	M	M	H	H	M	M	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. K. E. Vivekanandan	Dr. M. Thangavel

Course Code	Title		
23U3MBE608	Discipline Specific Elective Paper III Group B - Microbiology and Entrepreneurship		
Semester : VI	Credits : 4	CIA: 25 Marks	ESE: 75 Marks

Course Objective	Gain advanced knowledge on designing, launching and running a new business using potential microorganisms.
Course Category	Employability
Development Needs	Global
Course Description	Students have the ability on entrepreneurship that enable to combine science with business skills and give way for employability.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basic concepts of entrepreneurship and become a young women Entrepreneur.	Lecture / Video lessons	Assignment
CO 2	Get knowledge in mushroom cultivation and other value added products.	Demo / Model Preparation	Model Preparation
CO 3	Attain technical knowledge on different composting technology.	Demo / Model Preparation	Model Preparation
CO 4	Interpret the production of biopesticides and biopesticides.	Lecture / Video Tutorial	Seminar
CO 5	Summarize the details of patents and processing of patents.	Lecture	Seminar

Offered by Microbiology

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**History and concept of Entrepreneurship**: Characteristics & Functions and types of Entrepreneurs. Entrepreneurship – role in economic development. common problem in Entrepreneurship – Factors affecting entrepreneurial growth. Management concepts, Marketing Strategies	1	1
	Instructional Hours		12
Suggested Learning Methods: Video lectures			
II	**Mushroom cultivation:** Edible mushroom morphology, Nutritional and medicinal value. Preparation of spawn, types of spawning. Preparation of substrate - Casing – harvesting. Storage, Preservation and marketing. Mushroom diseases and its management **Value added products**: Cookies, Soup, Omlette, Samosa, Noodles, Pickles and Curry, Plate making and Marketing.	2	2-5
	Instructional Hours		12
Suggested Learning Methods: Online tutorial			
III	**Vermicomposting**: Biology and ecological classification of earthworm. Physical and chemical effects of earthworm on soil, Vermicomposting - species employed, methods and types of production – preparation of vermin wash – Field application and crop response, Storage and marketing of composts. Vermi Brick preparation.	3	3-9

		Instructional Hours	12
Suggested Learning Methods: Model presentation			
IV	**Biofertilizer**: Rhizobium, BGA, Azolla, VAM – bioinoculum, mass production- carriers, field application and crop response and Liquid biofertilizers. Biopesticide – bacteria and fungi. Production of SCP – Spirulina and Yeast.	4	2
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
V	**Patents and process**: History of Indian patent system, Patenting authorities, requirements of patenting, types of patents, types of patent applications in India, farmer's rights.	5	16
		Instructional Hours	12
Suggested Learning Methods: Model presentation and video lectures			
		Total Hours	60

Text Books	1. Khanka S.S. **Entrepreneurial Development**. S. Chand & Company, New Delhi. 3rd Edition, 2003. 2. Kanniyan.S and Ramaswamy K. A. **Handbook of Edible Mushrooms**. Today's and Tomorrow's Printers, New Delhi, 1980. 3. Rhonda Sherman, **The Worm Farmer's Handbook**. Chelsea Green Publishing, 2018. 4. Panda H, **Manufacture of Biofertilizer and Organic Farming**, Asia Pacific Business Press, 2011. 5. Sateesh MK., Bioethics and Biosafety, I.K. International Publishing House Pvt. Ltd., 2008.
Reference Books	1. Vasant Desai. **Dynamics of Entrepreneurial Development and Management**. Himalaya Publishing House, New Delhi, 2001. 2. Chang S.T and Hayes W.A. **Biology and Cultivation of Mushrooms**. Academic Press, NewYork, 1978.
Web. URLs	1. https://aggie-horticulture.tamu.edu/food-technology/food-processing-entrepreneurs/microbiology-of-food/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Demo	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	M	M	H	M	M	H	H	M	L	L	H
CO2	H	H	H	M	M	H	M	H	H	H	L	L	M
CO3	H	M	M	H	H	M	M	M	M	M	L	L	M
CO4	M	M	H	H	M	H	M	H	H	M	M	M	L
CO5	H	H	M	H	H	H	H	H	H	M	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBE609	**Discipline Specific Elective Paper III** **Group C – Microbial Diagnosis in Health Clinics**		
Semester: VI	**Credits: 4**	**CIA: 25 Marks**	**ESE: 75 Marks**

Course Objective	Gain advanced knowledge on Importance of diagnosis of diseases.
Course Category	Employability
Development Needs	Global
Course Description	Students have the ability several diagnostic methods used ranging from direct methods, by directly detecting the microorganism causing the infection, such as microscopy, cultures, specific gene detection and antigen detection, to indirect methods, such as serology, in which the levels of specific antibodies against certain microorganism helps in employability.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basic concepts of Microscopic examination and culture methods.	Lecture / Video lessons	Assignment
CO 2	Get knowledge about Importance of diagnosis of diseases.	Demo / Model Preparation	Seminar
CO 3	Attain technical knowledge on knowledge on Collection of Clinical Samples.	Demo / Model Preparation	Assignment
CO 4	Separate different the Serological, Molecular method.	Lecture / Video Tutorial	Seminar
CO 5	Apply methods of testing for Antibiotic sensitivity in Bacteria.	Lecture	Seminar

Offered by **Microbiology**

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Microscopic examination and culture methods:** Examination of sample by staining - Gram stain, Ziehl - Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria. Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar.	2	13
	Instructional Hours		12
Suggested Learning Methods: Video lectures			
II	**Importance of diagnosis of diseases :** Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, clinical samples for diagnosis of infectious disease	2	6
	Instructional Hours		12
Suggested Learning Methods: Online tutorial			

III	**Collection of Clinical Samples**: How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.	2	1
		Instructional Hours	12
Suggested Learning Methods: Model presentation/ Video lectures			
IV	**Serological, Molecular methods and Kits for rapid Detection of Pathogens**: Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes. Typhoid, Dengue and HIV, Swine flu,RPR, Non Invasive testing, Serology.	2	10
		Instructional Hours	12
Suggested Learning Methods: Video lectures			
V	**Testing for Antibiotic sensitivity in Bacteria**: Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method.	1	11
		Instructional Hours	12
Suggested Learning Methods: Model presentation and video lectures			
		Total Hours	60

Text Books	1. Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd. 2. Patricia, M.T. Bailey and Scott's Diagnostic Microbiology, 13th Edition, Mosby, Inc. Publishers, China. 2014.
Reference Books	1. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition. 2. Mosby. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mc cartney Practical Medical Microbiology, 14th edition, Elsevier. 3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.
Web. URLs	https://www.ncbi.nlm.nih.gov/books/NBK8014/

Tools for Assessment (25 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Demo	Total
5	5	6	3	3	3	25

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	M	H	M	M	H	H	M	L	L	H
CO2	H	H	H	M	M	H	M	H	H	H	L	L	M
CO3	H	M	M	H	H	M	M	M	M	M	L	L	M
CO4	M	M	H	H	M	H	M	H	H	M	M	M	L
CO5	H	H	M	H	H	H	H	H	H	M	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBP616	Core Paper XIV – Lab in Immunology and Medical Microbiology		
Semester: V & VI	Credits: 4	CIA: 40 Marks	ESE: 60 Marks

Course Objective	To assimilate knowledge across Industrial, immunological and medical discipline.
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	Students will develop skills on isolation, and enumeration of microbes from air, water and effluent samples. Collection and processing of clinical samples and the testing methods.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Get hands on exposure, knowledge and awareness of the basic tests in Industrial Microbiology	Lecture / Hands on	Behaviour & Performance
CO 2	Acquire knowledge about updated recent analysis methods.	Lecture / Hands on	Observation
CO 3	Acquire knowledge about the clinical samples and their testing methods.	Lecture / Hands on	Performance
CO 4	Understanding of the knowledge of medically important immunological procedures.	Lecture / Hands on	Performance
CO 5	Understand the testing knowledge in the field of medical microbiology	Lecture / Hands on	Observation

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 5 & 5

Exp No	Experiments
1.	**Immunology:** ABO Blood grouping and Rh typing
2.	WIDAL Test
3.	RPR and CRP
4.	ASO and pregnancy test
5.	Total and differential blood cell count by haemocytometer
6.	Radial and Double immuno diffusion
7.	Demonstration of ELISA, SDS PAGE, Western Blotting
8.	**Medical Microbiology** Isolation, identification of following pathogens from clinical samples: *E. coli, Salmonella spp., Pseudomonas spp., Proteus spp., Klebsiella spp., Staphylococcus spp, Streptococcus spp.*
9.	*Isolation of Clinically important Fungi – Candida albicans (Germ Tube Technique)*
10.	Antibiotic sensitivity testing of the isolates (for Gram negative and Gram Positive)
11.	Examination of stool for ova/cyst by direct/ concentration method

Total Hours	**150 Hrs**
Text Books	1. Rajan S and Selvi Christy R. **Experimental Procedures in Life sciences**. Anajanaa Book House, Chennai, 2015. 2. James G Cappuccino and Natalie Sherman. **Microbiology - A Laboratory Manual**(4th edition).The Benjamin publishing company, New York. 2016.
Reference Books	1. James G. Cappuccino and Chad Welsh. **Microbiology A Laboratory Manual**. Pearson Education Limited, 2017. 2. Dubey RC and Maheshwari DK. (2002). **Practical Microbiology**. S Chand and Co. Ltd., New Delhi, 2002. 3. Gunasekaran P. **Laboratory Manual in Microbiology**. New Age International, 2007
Web. URLs	1. https://microbenotes.com/fields-of-microbiology/ 2. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/1%3A_Introduction_to_Microbiology/1.3%3A_The_Science_of_Microbiology /1.3B_Applied_Microbiology

Tools for Assessment (40 Marks)

Laboratory Performance			Test - I	Test - II	Observation notebook	Total
Level of engagement in lab	Preparation	Result				
5	5	5	10	10	5	40

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	M	L	M	L	M	M	L	H	L	M
CO2	H	H	L	M	L	H	L	L	L	M	L	M	L
CO3	H	M	L	M	L	H	L	M	M	H	M	H	M
CO4	M	H	L	M	L	M	L	L	M	H	M	L	L
CO5	M	M	L	H	L	M	L	L	H	M	M	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. B. David Jayaseelan	Dr. M. Thangavel

Course Code	Title		
23U3MBP617	Core Paper XIII – Lab in Industrial and Food Microbiology		
Semester: V & VI	Credits: 4	CIA: 40 Marks	ESE: 60 Marks

Course Objective	To assimilate knowledge across Environment, agriculture and food microbiology discipline.
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	Students will develop skills on the isolation, enumeration and assessment of microorganisms from air, water, plants, food and milk samples.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	To get hands on exposure for the analysis of microorganisms present in air.	Lecture / Hands on	Behaviour & Performance
CO 2	To interpret the analysis of water to confirm the presence or absence of microorganisms.	Lecture / Hands on	Observation
CO 3	To acquire knowledge on isolation and identification of bacteria and fungi from the infected plant materials.	Lecture / Hands on	Performance
CO 4	To develop skills on isolation and enumeration of bacteria and fungi from spoiled foods.	Lecture / Hands on	Performance
CO 5	To understand the assessment methods involved in checking the quality of milk.	Lecture / Hands on	Observation

Offered by	**Microbiology**

Course Content	Instructional Hours / Week: 5 & 5

Exp No	Experiments
1.	Production of Wine from grapes
2.	Alcohol fermentation by *Saccharomyces cerevisiae*
3.	Starch (Amylase), casein (Protease) and lipid (Lipase) hydrolyses tests
4.	Most Probable number count method for estimation of water quality
5.	MBRT (Methylene Blue Reductase test) for the detection of milk quality
6.	Antibiotic susceptibility test using Muller Hinton Agar
7.	Isolation of casein from the given milk products
8.	Isolation and Identification of the given bacterial populations from the given fruit juice
9.	Alcohol estimation of the given wine sample by using dichromate oxidation method
10.	Microbiological examination of foods - Isolation and enumeration of bacteria and fungi from fresh and spoiled fruits and vegetables
11.	Detection of bacterial spoilage of canned food.
12.	Isolation of probiotics from the given milk sample

13.	Isolation and enumeration of fungal populations from the given meat products.
Total Hours	**150 Hrs**
Text Books	1. Rajan, S. and R. Selvi Christy. **Experimental Procedures in Life Sciences**. Anajana Book House, Chennai, 2015. 2. James G Cappuccino and N. Sherman. **Microbiology - A Laboratory Manual** (4th edition). The Benjamin publishing company, New York. 2016. 3. Okafor, N. **Environmental Microbiology of Aquatic & Waste Systems**. 1st edition, Springer, New York, 2011.
Reference Books	1. Dubey, R.C. and D.K. Maheshwari. **Practical Microbiology**. S Chand and Co. Ltd., New Delhi, 2002. 2. Aneja, K.R. **Experiments in Microbiology, and Biotechnology**. New Age International (P) Limited Publishers, 2010. 3. Gunasekaran P. **Laboratory Manual in Microbiology**. New Age International, 2007.
Web. URLs	1. https://microbenotes.com/fields-of-microbiology/ 2. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/1%3A_Introduction_to_Microbiology/1.3%3A_The_Science_of_Microbiology/1.3B_Applied_Microbiology

Tools for Assessment (40 Marks)

Laboratory Performance			Test - I	Test - II	Observation notebook	Total
Level of engagement in lab	Preparation	Result				
5	5	5	10	10	5	40

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	H	H	M	M	H	H	M	M	L	H
CO2	H	M	M	H	H	H	H	H	H	M	L	L	M
CO3	M	M	M	H	M	L	L	M	M	H	M	M	H
CO4	M	M	M	H	H	M	M	M	H	M	L	M	H
CO5	H	H	H	H	H	M	M	M	H	L	L	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

Course Code	Title		
23U4MBZ604	Skill Based Paper IV – Lab in rDNA Technology		
Semester: VI	Credits: 3	CIA: 30 Marks	ESE: 45 Marks

Course Objective	Students can get hands on experience on variety of techniques in genetics and molecular biology research
Course Category	Skill Development / Employability
Development Needs	Global
Course Description	The course helps student learning through hands-on exercise of recombinant DNA techniques, in a broader context of achieving a recombinant DNA goal. The techniques and skills in which the students will be trained include handling recombinant organisms, restriction and Southern blot analysis of DNA, preparing and cloning PCR fragments.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Acquire knowledge on isolation and purification of DNA from bacteria.	Lecture / Demonstration	Assignment
CO 2	Interpret the quantity and purity of DNA and RNA.	Tutorial	Behaviour
CO 3	Understand the techniques to ligate DNA into cloning vectors.	Lectures / Video Lessons	Performance
CO 4	Get hands on training on bacterial transformation and PCR	Hands on	Observation
CO 5	Analyse the DNA fragments by hybridization and finger printing.	Demonstration	Observation

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Course Content	Instructional Hours / Week: 4

	Description
1.	Restriction digestion of DNA.
2.	Purification of digested DNA by column chromatography.
3.	Transformation
4.	Plasmid DNA purification / Miniprep.
5.	Polymerase chain reaction (Demo)
6.	Southern hybridization.
7.	DNA finger printing.
8.	SDS-PAGE.
9.	RAPD.
10.	Electroporation.
	Total Hours **60 Hrs**

Text Books	1. Rajan and Selvi Christy. Text book of Experimental Procedures in Life Science. Anjanaa Publisher, 2010.

	2. Michael R. Green and J. Sambrook. Molecular cloning: A laboratory manual, Cold spring harbor laboratory press, 4th edition, 2014. 3. Fletcher, L., E. Goss, P. Phelps, A. Wheeler and S. O'Grady. Introduction to Biotechnology: Laboratory Manual. Austin Community College, Biotechnology Department, 2011
Reference Books	1. Sue Carson, Heather Miller, Melissa Srougi, D. Scott Witherow. Molecular Biology Techniques: A classroom laboratory manual. Elseiver, 2019. 2. Aneja, K. R. Experiment sin Microbiology, Plant Pathology and Biotechnology. New Age International (P) Limited Publisher, 2014. 3. Hasan, N.A. Laboratory Manual of Basic Molecular Biology Techniques. Research Gate, 2021
Web. URLs	https://www.sciencedirect.com/book/9780127844008/recombinant-dna-laboratory-manual

Tools for Assessment (30 Marks)

Level of Engagement in lab	Preparation	Result	Test – I (Mid sem)	Test II (Model)	Observation note book	Total
4	4	4	7	7	4	30

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	M	H	H	H	H	M	H	L	H
CO2	H	H	M	M	M	M	H	H	M	M	H	L	H
CO3	H	H	L	M	H	M	M	H	H	L	H	L	M
CO4	M	H	H	H	H	M	H	H	H	H	H	L	M
CO5	H	H	M	L	M	H	H	H	H	M	L	L	H

H-High; M-Medium; L-Low

Course designed by	Verified by Chairman
Dr. S. Esath Natheer	Dr. M. Thangavel

SELF STUDY PAPERS

Course Code	Title	
23UMBSS01	Self-Study Paper I–Solid Waste Management	
Semester: II to V	Credits: 1	ESE: 50 Marks

Course Objective	Gain advanced knowledge on Slid wastes and its management. Planning and programs of the waste management systems.
Course Category	Employability
Development Needs	Global
Course Description	Students have the ability on entrepreneurship that enable to develop business skills on the set up of solid waste management consultation and give way for employability.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basic concepts of waste generation and waste management strategies.	Lecture / Video lessons	Assignment
CO 2	Get knowledge about the planning of the programs for the management of municipal wastes	Lecture / Video lessons	Model Preparation
CO 3	To have knowledge on the characterization of solid waste and its disposal techniques	Demo / Model Preparation	Model Preparation
CO 4	To understand the sources and methods of solid wastes and the various Acts on SWM	Lecture / Video Tutorial	Seminar
CO 5	Understand the method of SW collection and the recycling techniques.	Lecture	Seminar

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Course Content

Unit	Description	Text Book	Chapters
I	**Waste generation and management**: Issues in solid waste management, Integrated waste management, Implementing integrated waste management strategies, Typical costs for major waste management options.	1	1
II	**Planning for municipal solid waste management programs**: State solid waste management planning, Local and regional solid waste management planning.	1	4
III	**Solid waste stream characteristics**: Municipal solid waste, Methods of characterizing municipal solid waste, Municipal solid waste management, Discards of municipal solid waste by volume, The variability of municipal solid waste generation	3	3-9
IV	**Source Reduction, Waste Minimization and Environmental Laws**: Hierarchy of Waste Management, Principles of Life Cycle, Costs of Environmental Management, Waste Minimization at Work, NEPA, RCRA, Clean Air Act, Clean Water Act, CERCLA, Emergency Planning and Community Right-To-Know Act, Oil Pollution Act, Pollution Prevention Act, Safe Drinking Water Act, Toxic Substances Control Act	4	2
V	**Collection of solid waste:** Types of waste collection services, Types of collection systems, equipment, and personnel requirements, Collection routes, Management of collection systems, Collection system economics, Recycling- Development and implementation of Materials recovery facilities.	1	7

Text Books	1. George T chobanoglous, Frank Kreith. **Handbook of Solid Waste Management**,2nd edition, The McGraw–Hill,2002. 2. Cheremisinoff, Nicholas P. Handbook of Solid Waste **Management and Waste Minimization Technologies**. Elsevier Science (USA),2003
Reference Books	1. Nag, K. Vizayakumar, **Environmental Education and Solid Waste Management**, New Age International Ltd., Publishers, 2005. 2. Samuel Stucki, Christian Ludwig (auth.), Dr. Christian Ludwig, Dr. Stefanie Hellweg, Dr. Samuel Stucki. **Municipal Solid Waste Management: Strategies and Technologies for Sustainable Solutions**, 1st edition, Springer-Verlag Berlin Heidelberg, 2003
Web. URLs	1. https://courses.lumenlearning.com/suny-monroe-environmentalbiology/ 2. https://www.epa.gov/sites/production/files/2020/documents/master_swmg_10-20-20_0.pdf

Course designed by	**Verified by Chairman**
Dr. R. Kasimani	Dr. M. Thangavel

9/9/2023
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Nehru Arts and Science College (Autonomous)
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Academic Council
Dr. B. Anirudhan
Chairman
Nehru Arts and Science College

Course Code	Title	
23UMBSS02	Self-Study Paper II -Human Anatomy and Physiology	
Semester–II to V	Credit:1	ESE: 50 Marks

Course Objective	Gain advanced knowledge. On the Human Anatomy and physiology
Course Category	Skill and Knowledge
Development Needs	Global
Course Description	Students have the ability to develop the knowledge in the Human anatomy and Physiological mechanisms of the body.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basic concepts of cell and organization of the Human body	Lecture / Video lessons	Assignment
CO 2	Get knowledge about the Circulatory and Hart system and its functions	Lecture / Video Preparation	Model Preparation
CO 3	Acquire knowledge on the Respiratory, Nervous and Endocrine systems and its functions	Lecture / Video Preparation	Model Preparation
CO 4	To understand the anatomy and functioning of the digestive system	Lecture / Video Tutorial	Seminar
CO 5	Explain the role of each body system in maintaining homeostasis	Lecture	Seminar

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Course Content

Unit	Description	Text Book	Chapters
I	**Introduction to the human body**, chemical and tissue level of organization: The body and its constituents, Introduction to the human body, Introduction to the chemistry of life, The cells, tissues and organization of the body.	2	1-4
II	**Circulatory and cardiac system**: The blood, The cardiovascular system.	1	7,8
III	**Body communication and respiration**: The nervous system, endocrine system, and respiratory system.	2	12- 8,23
IV	**Digestive system:** Activity, organization, organs, mouth, pharynx, esophagus, structure of digestive system, process of digestion	4	2
V	**Protection and survival:** The tissue, skin, skeleton, muscular, renal and reproductive systems	5	16

Text Books	1. IanPeate, Muralitharan Nair, Fundamentals of Anatomy and Physiology for Nursing and Health care Students, 2nd edition, WileyBalckwell,2017. 2. Gerard J. Tortora, Bryan H. Derrickson, Principles of Anatomy and Physiology, 14thEdition, Wiley, 2014.
Reference Books	1. Anne Waugh, Allison Grant, **Ross & Wilson Anatomy and Physiology in Health and Illness,** 13th edition, Elsevier, 2018. 2. Frederic H. Martini, JudiL. Nath, Edwin F. Bartholomew. **Fundamentals of Anatomy & Physiology**, 9thedition, Benjamin Cummings,2012.
Web. URLs	https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/nursing_students/LN_human_anat_final.pdf https://www.drnaitiktrivedi.com/index.php/notes/anatomy-physiology-notes/

Course designed by	Verified by
Dr. B. David Jayaseelan	Dr. M. Thangavel